Condenser Fan Pak User Manual

Installing, Configuring, and Troubleshooting the CFP

Instruction Bulletin

EAV73941

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Retain for future use.

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Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Section 1—Introduction

The Schneider Electric Condenser Fan Pak (CFP) is a retrofit solution incorporating Floating High Pressure (FHP) control and Variable Frequency Drive (VFD) fan control for multi-fan, air-cooled chillers and condensers.

This instruction bulletin describes the procedures for receiving, installing, starting-up, configuring, and troubleshooting the CFP.

Product Overview

The CFP solution monitors the refrigerant pressure and ambient outdoor air temperature.

The CFP regulates refrigerant pressure by controlling the condenser fans with the VFD. This optimizes the operation and energy consumption of the air-cooled chiller.

The CFP's Type 3R enclosure isolates critical internal electronic components from harsh environments. This design eliminates the need for air filters and separate cooling devices such as air conditioning units or heat exchangers.

The Condenser Fan Pak includes the following features:

- ATV212 variable frequency drives
- UL 508A Listed
- 24 Vdc control power
- 22 mm pilot lights
  - — POWER ON (green)
  - — ALARM (amber)
  - — MTR OL TRIP (red)
  - — BYPASS (blue)
- VFD-Bypass selector switches
- Service Switch
- NEMA 3R enclosure
- Door-mounted, colored touch-screen Human Machine Interface (HMI) display
- Dedicated on-board controller
- Refrigerant pressure transducers and connecting cables
- Outdoor air temperature sensor and cable
- TVSS surge protection
- Optional cabinet heater
- Optional Bypass[1]
- Optional Network Connectivity
  - — BACnet MS/TP
  - — BACnet IP
  - — Modbus TCP

[1] Returns condenser fan control to existing equipment controls

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Related Documentation

For further information, refer to the latest revision of the following instruction bulletins. They are available from the Classic Technical Library at www.Schneider-Electric.com.

Table 1: Instruction Bulletins

Bulletin No.	Title
9000IB1401	*Condenser Fan Pak Quick-Start Guide*
S1A53832	*Altivar® 212 Installation Manual*
S1A53838	*ATV212 Programming Manual*
30072-200-50	*Handling, Installation, Operation, and Maintenance of Electrical Control Equipment*

Terminology

When used as a component of the CFP, devices with part numbers beginning with ATV212 are referred to as a Variable Frequency Drive (VFD) or drive.

The combination of the VFD, the enclosure, and the power and control circuits that constitute the Condenser Fan Pak is referred to as the CFP.

Before You Begin

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this bulletin in its entirety before installing or operating the CFP. Installation, adjustment, repair, and maintenance of the CFP must be performed by qualified personnel.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this CFP operate at line voltage. **Do not touch**. Use only electrically insulated tools.
- Some terminals may have voltage (Bypass terminals and components) on them when the main panel disconnect is open.
- **Do not** short across the VFD DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the CFP, follow the lockout/tagout procedure:
  a. Disconnect all power including external control power that may be present before servicing the CFP.
  b. Place a DO NOT TURN ON label on the CFP disconnect.
  c. Lock disconnect in the open position.
- **Wait 15 minutes** for the VFD DC bus capacitors to discharge. Then follow the DC Bus Voltage Measurement Procedure on page 32 to verify that the DC voltage is less than 42 V. The VFD LEDs are **not** indicators of the absence of DC bus voltage.
- Disconnect and lock out the Bypass power source if provided.
- Install and close all covers before applying power or starting and stopping the CFP.

Failure to follow these instructions will result in death or serious injury.

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⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow manufacturer's instructions for selecting and setting branch circuit protective devices and overloads (when present) to maintain overcurrent, short circuit, and ground fault protection.
- The opening of the branch-circuit-protective device may be an indication that a fault has been interrupted. To provide continued protection against risk of fire or shock hazard, examine current carrying parts and other circuit components, replacing them if damaged.
- If burnout of an overload relay's thermal unit occurs, replace the entire overload relay unit.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E®, Standard for Electrical Safety in the Workplace.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Before turning on the CFP or upon exiting the configuration menus, ensure that the CFP inputs are in a state that will not cause the CFP to run. Otherwise, the motor can start immediately.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

Before turning on and configuring the CFP, ensure that the line voltage is compatible with the line voltage range specified on the CFP nameplate. The CFP can be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in injury or equipment damage.

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Follow these precautions before installing the CFP:

- The Type 3R controller is suitable for installation in a Pollution Degree 2 environment as defined in NEMA ICS1 and IEC 90664-1. The expected environment must be compatible with this rating.
- When attaching wall-mountable controllers to their mounting surfaces, use fasteners rated for the weight of the apparatus, the expected shock and vibration of the installation, and the expected environment.

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Section 2—Technical Characteristics

This section describes the technical characteristics of the CFP, including:

- CFP catalog number
- Nameplate data
- Enclosure dimensions
- Input current ratings
- Short circuit ratings
- CFP features
- CFP dimensions and weight

Catalog Number Nomenclature

The CFP catalog number, located on the nameplate on the inside of the door, is coded to describe the configuration and options present. For example, a CFP catalog number of CFDB44H1YX indicates a Condenser Fan Pak configured as follows:

- Type R-407C refrigerant
- 5.5-8.0FLA@208-230V condenser fan motor
- Four fan motors in Circuit 1
- Four fan motors in Circuit 2
- Enclosure with a Type 3R environmental rating
- BACnet IP network communication protocol
- Full-voltage Bypass
- No cabinet heater

Use the following tables to translate a CFP catalog number into a description of the Condenser Fan Pak.

Table 2: Catalog Number

CF					H				
1	2	3	4	5	6	7	8	9	10

1: Product

Code	Controller
CF	Condenser Fan Pak

2: Refrigerant

Code	Type
A	R-22
B	R-134A
C	R-404
D	R-407C
E	R-410A

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3: Condenser Fan Motor

Code	FLA@Voltage
A	3.8 - 5.5 @208-230V
B	5.5 - 8.0 @208-230V
C	8.0 - 11.0 @208-230V
D	1.8 - 2.6 @480V
E	2.6 - 3.7 @480V
F	3.8 - 5.5 @480V

4: Fan Motors in Circuit #1

Code	Quantity
2	2
4	4
6	6
8	8

5: Fan Motors in Circuit #2

Code	Quantity
2	2
4	4
6	6
8	8

6: Enclosure Type

Code	Environmental Rating
H	Type 3R

7: Network Communication

Code	Network Protocol
X	None
1	BACnet IP
2	BACnet MS/TP
3	Modbus TCP

8: Bypass

Code	Feature
X	Without Bypass
Y	Full Voltage Bypass[1]

[1] Bypass returns fan motor control back to existing equipment control.

9: Cold Weather Cabinet Heater

Code	Feature
X	Without Cabinet Heater
Y	With Cabinet Heater

10:

Code	Feature
X	Reserved

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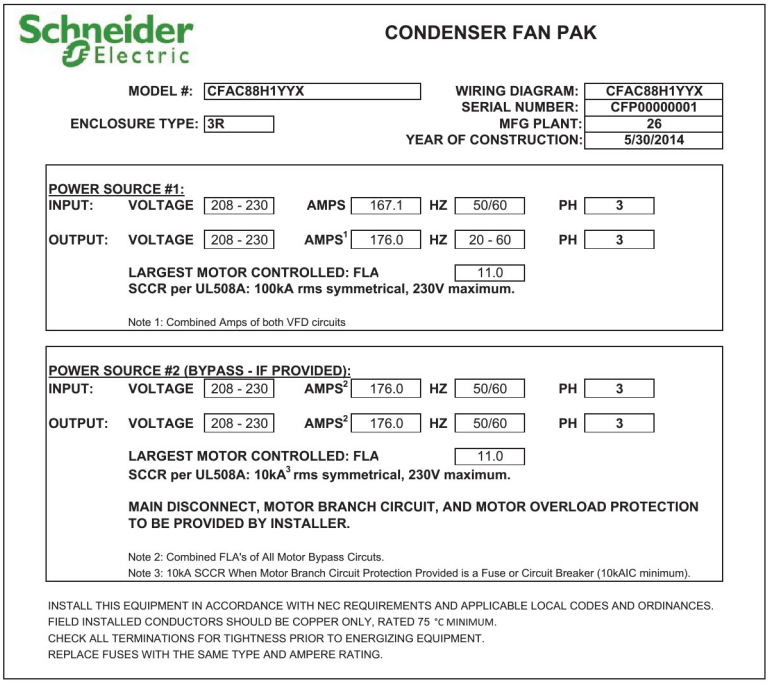
Condenser Fan Pak Nameplate

When identifying or describing the CFP, use the data from the CFP nameplate on the inside of the door (Figure 1).

Figure 1: CFP Nameplate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CONDENSER FAN PAK
MODEL #: CFAC88H1YYX
ENCLOSURE TYPE: 3R
WIRING DIAGRAM: CFAC88H1YYX
SERIAL NUMBER: CFP00000001
MFG PLANT: 26
YEAR OF CONSTRUCTION: 5/30/2014
POWER SOURCE #1:
INPUT: VOLTAGE 208 - 230 AMPS 167.1 HZ 50/60 PH 3
OUTPUT: VOLTAGE 208 - 230 AMPS[1] 176.0 HZ 20 - 60 PH 3
LARGEST MOTOR CONTROLLED: FLA 11.0
SCCR per UL508A: 100kA rms symmetrical, 230V maximum.
Note 1: Combined Amps of both VFD circuits
POWER SOURCE #2 (BYPASS - IF PROVIDED):
INPUT: VOLTAGE 208 - 230 AMPS[2] 176.0 HZ 50/60 PH 3
OUTPUT: VOLTAGE 208 - 230 AMPS[2] 176.0 HZ 50/60 PH 3
LARGEST MOTOR CONTROLLED: FLA 11.0
SCCR per UL508A: 10kA[3] rms symmetrical, 230V maximum.
MAIN DISCONNECT, MOTOR BRANCH CIRCUIT, AND MOTOR OVERLOAD PROTECTION TO BE PROVIDED BY INSTALLER.
Note 2: Combined FLA's of All Motor Bypass Circuts.
Note 3: 10kA SCCR When Motor Branch Circuit Protection Provided is a Fuse or Circuit Breaker (10kAIC minimum).
INSTALL THIS EQUIPMENT IN ACCORDANCE WITH NEC REQUIREMENTS AND APPLICABLE LOCAL CODES AND ORDINANCES.
FIELD INSTALLED CONDUCTORS SHOULD BE COPPER ONLY, RATED 75 °C MINIMUM.
CHECK ALL TERMINATIONS FOR TIGHTNESS PRIOR TO ENERGIZING EQUIPMENT.
REPLACE FUSES WITH THE SAME TYPE AND AMPERE RATING.

Enclosure Dimensions

Table 3: Enclosure Dimensions in Inches

Frame Size	Height	Width	Depth
1	41.5	41.2	21.0
2	74.2[1]	44.2	24.0

[1] Includes 12-inch legs

Input Current Ratings

All branch circuit components and equipment, such as feeder cables, disconnect devices, and protective devices, must be rated for each power source's stated input current rating: Power Source #1 and Power Source #2 (Bypass option, if provided). The branch circuit feeder protection must be sized according to the National Electrical Code (NEC).

For Power Source #2 (Bypass option, if provided), the stated rating is the combined power for all of the Bypass motor circuits connected to the CFP. To determine the individual motor circuit amps, divide the stated Source #2 output amps by the total number of fan motors connected to the CFP. This information is printed on the CFP nameplate (Figure 1).

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Table 4: Input Line Currents for Selection of Branch Circuit Feeders, 208—230 V, Three-Phase

Catalog Number[1]	Input Rating			Output Rating							
	Source #1[2] Current	Source #2[3] Current (Bypass)	Hz	Total Motor Output FLA Per VFD/Ckt	Max Total CFP Motor Output FLA Ckts 1 & 2	VFD Output Hz	Motors/VFD Circuit	Max Motor FLA (Each)	Motor Overload FLA Range[4]	Enclosure Frame Size	Short-Circuit Current Rating (SCCR-kA) up to:
CF•A22H••••	32.8	22.0	50/60	11.0	22.0	20-60	2	5.5	3.8-5.5	1	100[5]
CF•A44H••••	45.2	44.0	50/60	22.0	44.0	20-60	4			1	100[5]
CF•A66H••••	88.8	66.0	50/60	33.0	66.0	20-60	6			2	100[5]
CF•A88H••••	90.5	88.0	50/60	44.0	88.0	20-60	8			2	100[5]
CF•B22H••••	32.8	32.0	50/60	16.0	32.0	20-60	2	8.0	5.5-8.0	1	100[5]
CF•B44H••••	59.4	64.0	50/60	32.0	64.0	20-60	4			1	100[5]
CF•B66H••••	118.5	96.0	50/60	48.0	96.0	20-60	6			2	100[5]
CF•B88H••••	140.9	128.0	50/60	64.0	128.0	20-60	8			2	100[5]
CF•C22H••••	45.2	44.0	50/60	22.0	44.0	20-60	2	11.0	8.0-11.5	1	100[5]
CF•C44H••••	90.5	88.0	50/60	44.0	88.0	20-60	4			2	100[5]
CF•C66H••••	140.9	132.0	50/60	66.0	132.0	20-60	6			2	100[5]
CF•C88H••••	167.1	176.0	50/60	88.0	176.0	20-60	8			2	100[5]

1 Base catalog number provided, • indicates option codes. See Catalog Number Nomenclature on page 11 for a detailed description of catalog numbers.

2 Source #1 input current applies when the condenser fan motors are controlled by the CFP VFDs.

3 Source #2 input current applies when in optional ByPass mode where the condenser fan motor control is switched from the CFP VFD control back to the original equipment controls. Value is the sum of all the controlled condenser fan motor FLAs.

4 CFP-provided motor overload protection is only active when condenser fans are controlled by the CFP VFDs. If provided, in Bypass operation mode, the fan motor overload protection is to be provided by the existing equipment motor circuit protection. Control power for the Bypass circuit is derived from Source #1. Source #1 must be energized for Bypass circuit to function.

5 100kA rating when operating in VFD mode of operation. If provided, in Bypass operation mode, SCCR = 10kA.

Table 5: Input Line Currents for Selection of Branch Circuit Feeders, 480 V, Three-Phase

Catalog Number[1]	Input Rating			Output Rating							
	Source #1[2] Current	Source #2[3] Current (Bypass)	Hz	Total Motor Output FLA Per VFD/Ckt	Max Total CFP Motor Output FLA Ckts 1 & 2	VFD Output Hz	Motors/VFD Circuit	Max Motor FLA (Each)	Motor Overload FLA Range[4]	Enclosure Frame Size	Short-Circuit Current Rating (SCCR-kA) up to:
CF•D22H••••	14.9	10.4	50/60	5.2	10.4	20-60	2	2.6	1.8-2.6	1	100[5]
CF•D44H••••	19.3	20.8	50/60	10.4	20.8	20-60	4			1	100[5]
CF•D66H••••	26.7	31.2	50/60	15.6	31.2	20-60	6			2	100[5]
CF•D88H••••	36.9	41.6	50/60	20.8	41.6	20-60	8			2	100[5]
CF•E22H••••	19.3	14.8	50/60	7.4	14.8	20-60	2	3.7	2.6-3.7	1	100[5]
CF•E44H••••	25.5	29.6	50/60	14.8	29.6	20-60	4			1	100[5]
CF•E66H••••	36.9	44.4	50/60	22.2	44.4	20-60	6			2	100[5]
CF•E88H••••	48.9	59.2	50/60	29.6	59.2	20-60	8			2	100[5]
CF•F22H••••	19.3	22.0	50/60	11.0	22.0	20-60	2	5.5	3.8-5.5	1	100[5]
CF•F44H••••	35.7	44.0	50/60	22.0	44.0	20-60	4			2	100[5]
CF•F66H••••	58.9	66.0	50/60	33.0	66.0	20-60	6			2	100[5]
CF•F88H••••	92.7	88.0	50/60	44.0	88.0	20-60	8			2	100[5]

1 Base catalog number provided, • indicates option codes. See Catalog Number Nomenclature on page 11 for a detailed description of catalog numbers.

2 Source #1 input current applies when the condenser fan motors are controlled by the CFP VFDs.

3 Source #2 input current applies when in optional ByPass mode where the condenser fan motor control is switched from the CFP VFD control back to the original equipment controls. Value is the sum of all the controlled condenser fan motor FLAs.

4 CFP-provided motor overload protection is only active when condenser fans are controlled by the CFP VFDs. If provided, in Bypass operation mode, the fan motor overload protection is to be provided by the existing equipment motor circuit protection. Control power for the Bypass circuit is derived from Source #1. Source #1 must be energized for Bypass circuit to function.

5 100kA rating when operating in VFD mode of operation. If provided, in Bypass operation mode, SCCR = 10kA.

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Specifications

Table 6: CFP Specifications[1]

Input Voltage	460 V ±10%, 230 V ±10%, 208 V ±10%
Displacement Power Factor	Approximately 0.96
Input Frequency	50/60 Hz ± 5%
Output Voltage	Three-phase output, maximum voltage equal to input voltage
Frequency Range of Power Converter	0.5 to 500 Hz (factory setting of 60 Hz)
Current Limit	110% of nominal drive full load current (FLA) for 60 seconds
Drive Protection	• Thermal protection of power converter • Phase loss of AC mains • Fuses
Motor Protection	Class 10 electromechanical overload protection when under VFD control; in Bypass mode, motor overload protection is provided by existing chiller equipment motor circuit protection.
Human Machine Interface Display	• Color, touch screen, Port USB type A, Mini B USB port, 24 Vdc • Modbus communication to CFP controller Also see *STU655 User Manual*, EIO0000000614
Temperature	**Storage:** -13 to +149 °F (-25 to +65 °C). **Operation:** +14 to +122 °F (-10 to 50 °C). -13 to +122 °F (-25 to 50 °C) with cold weather cabinet heater option
Humidity (Variable Frequency Drive)	95% with no condensation or dripping water, conforming to IEC 60068-2-3
Altitude (Variable Frequency Drive)	3,300 ft (1000 m) maximum without derating; derate the current by 1% for each additional 330 ft (100 m) up to 10,000 ft (3000 m).
Enclosure	Type 3R: all models, white color
Pollution Degree	Type 3R: Pollution degree 2 per NEMA ICS-1 Annex A and IEC 60664-1
Codes and Standards	UL Listed per UL 508A. Conforms to applicable NEMA ICS and NFPA standards. Manufactured under ISO 9001 standards.

[1] Specifications are for CFP product, for additional ATV212 VFD specifications, see *Altivar 212 Installation Guide*, S1A53832.

Short Circuit Ratings

All units include fuses as the overcurrent protective device (OCPD). For CFP short-circuit withstand current ratings, see Tables 4 and 5 on page 14.

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CFP Illustrated

Figure 2: Typical External View, CFP in a Type 3R White Enclosure

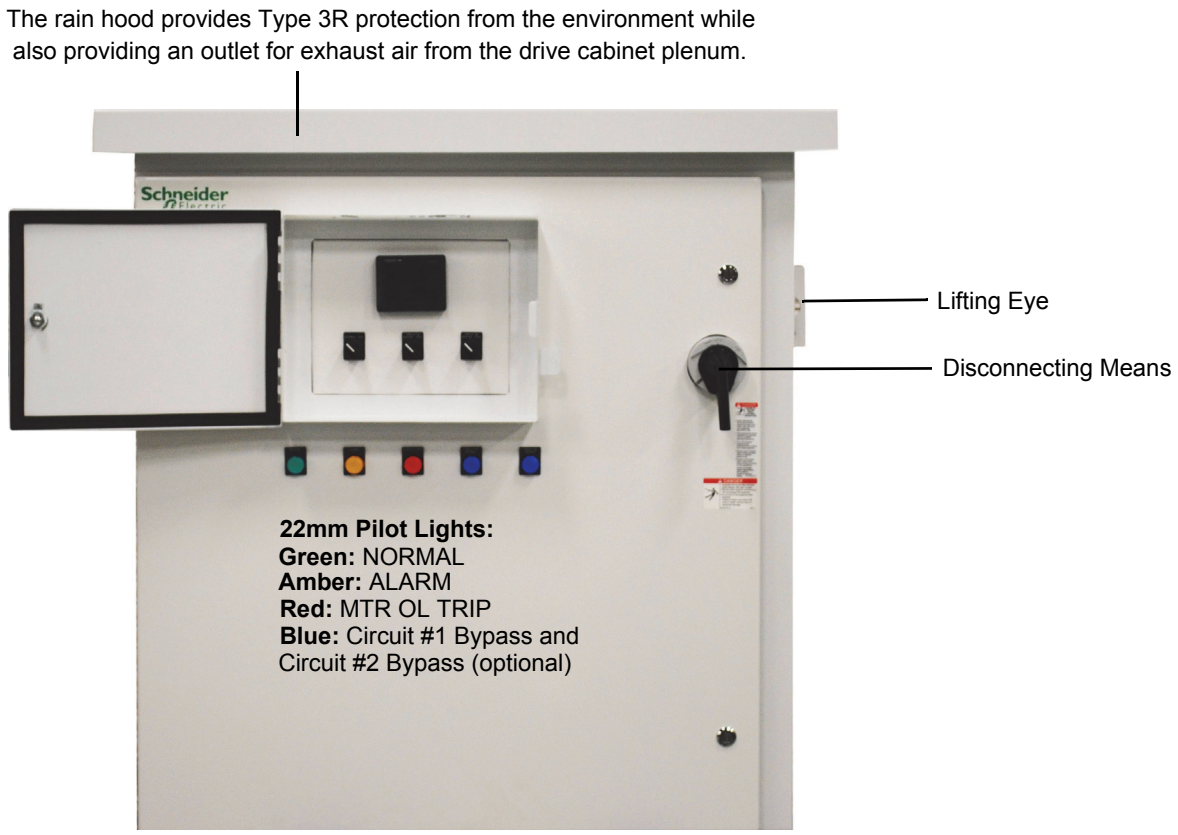
The rain hood provides Type 3R protection from the environment while also providing an outlet for exhaust air from the drive cabinet plenum.
Schneider Electric
Lifting Eye
Disconnecting Means
22mm Pilot Lights:
Green: NORMAL
Amber: ALARM
Red: MTR OL TRIP
Blue: Circuit #1 Bypass and Circuit #2 Bypass (optional)

Figure 3: Operations Panel

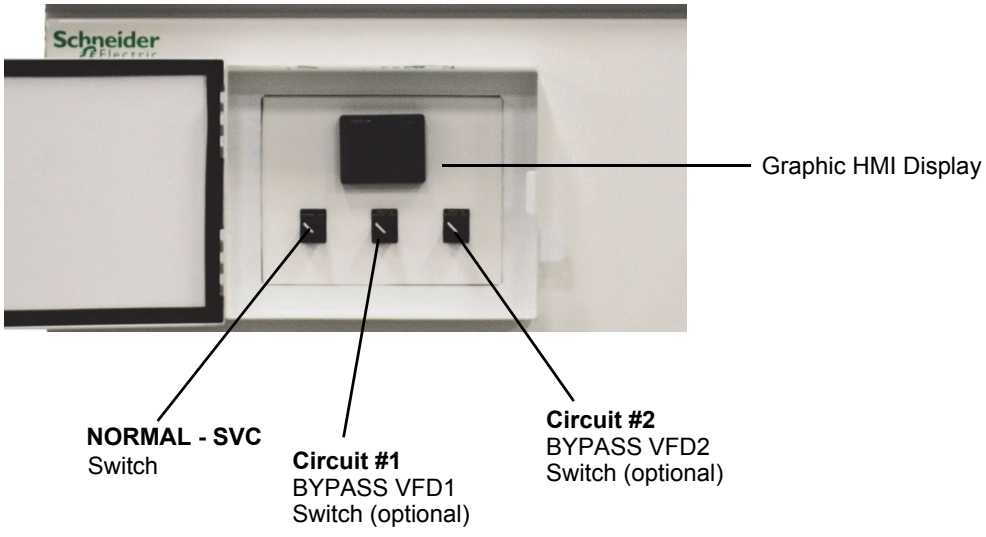

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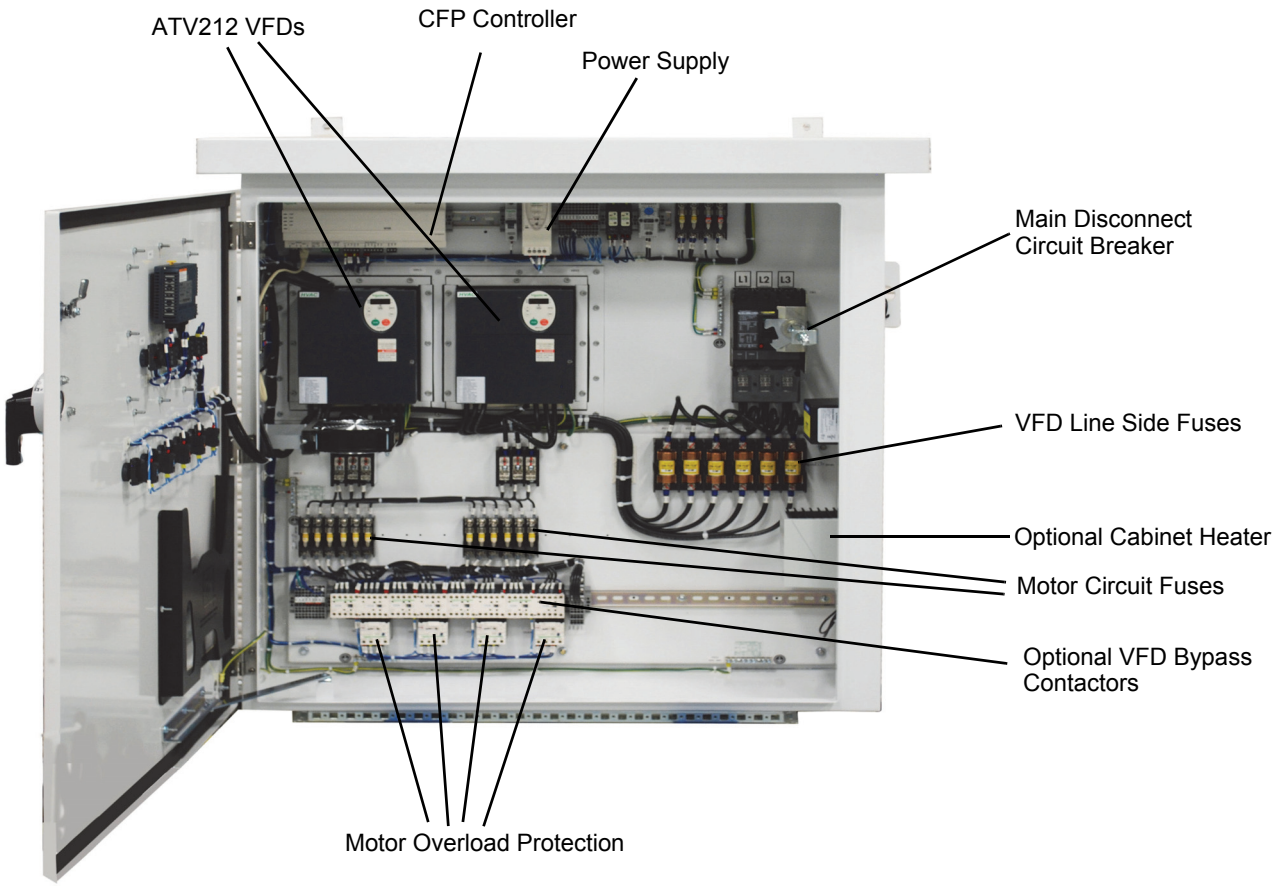
Figure 4: CFP, Internal View



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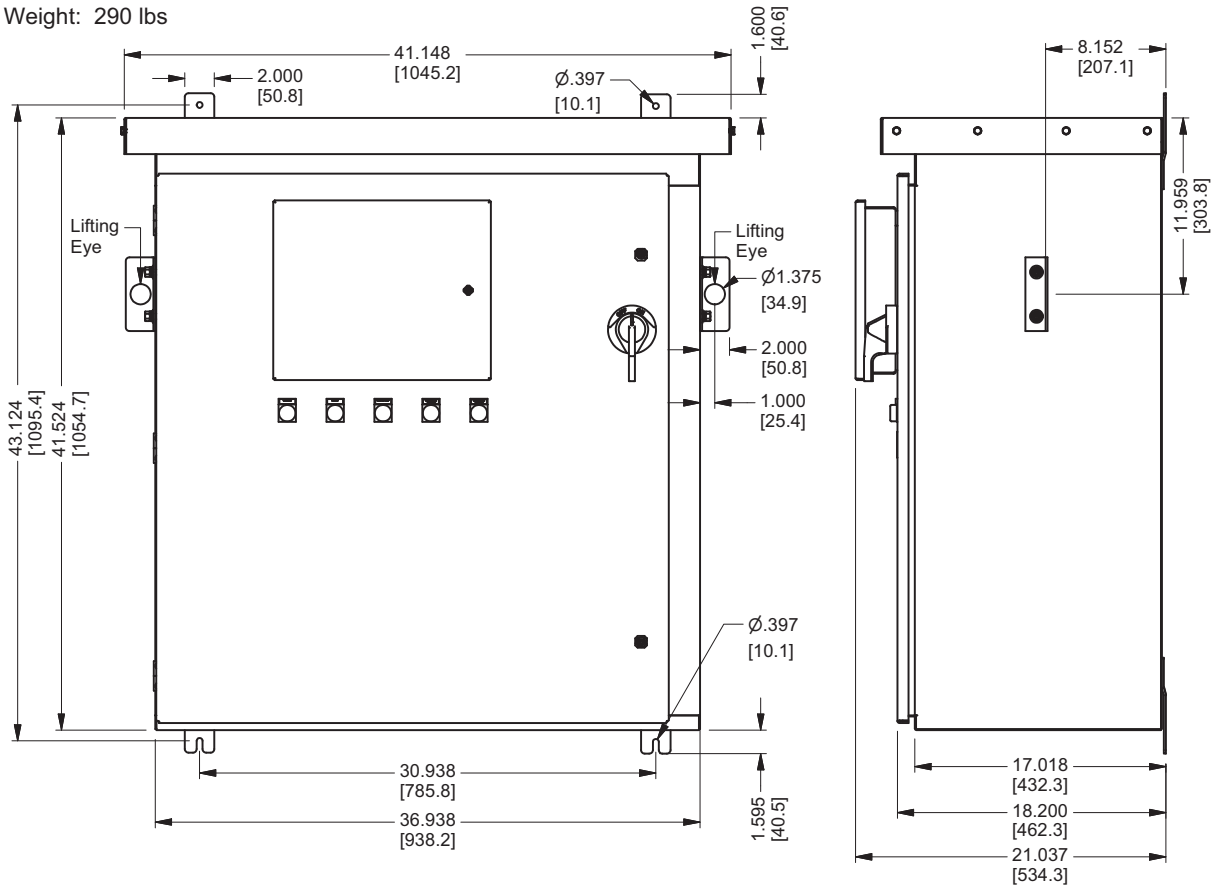
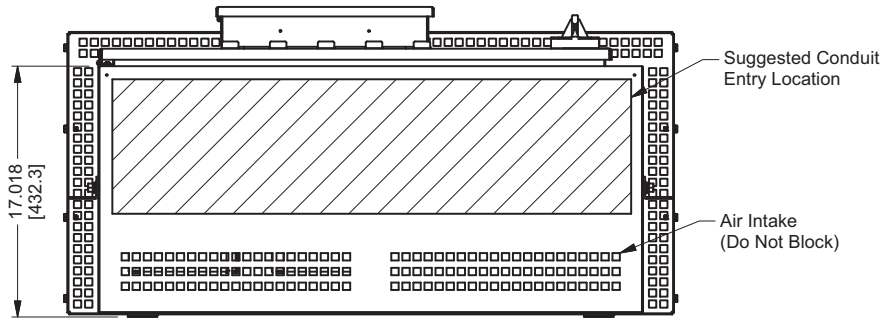
Dimensions and Weights

Figure 5: Frame Size 1 Enclosure

Dimensions: in.
[mm]
Weight: 290 lbs





BOTTOM ENTRY VIEW

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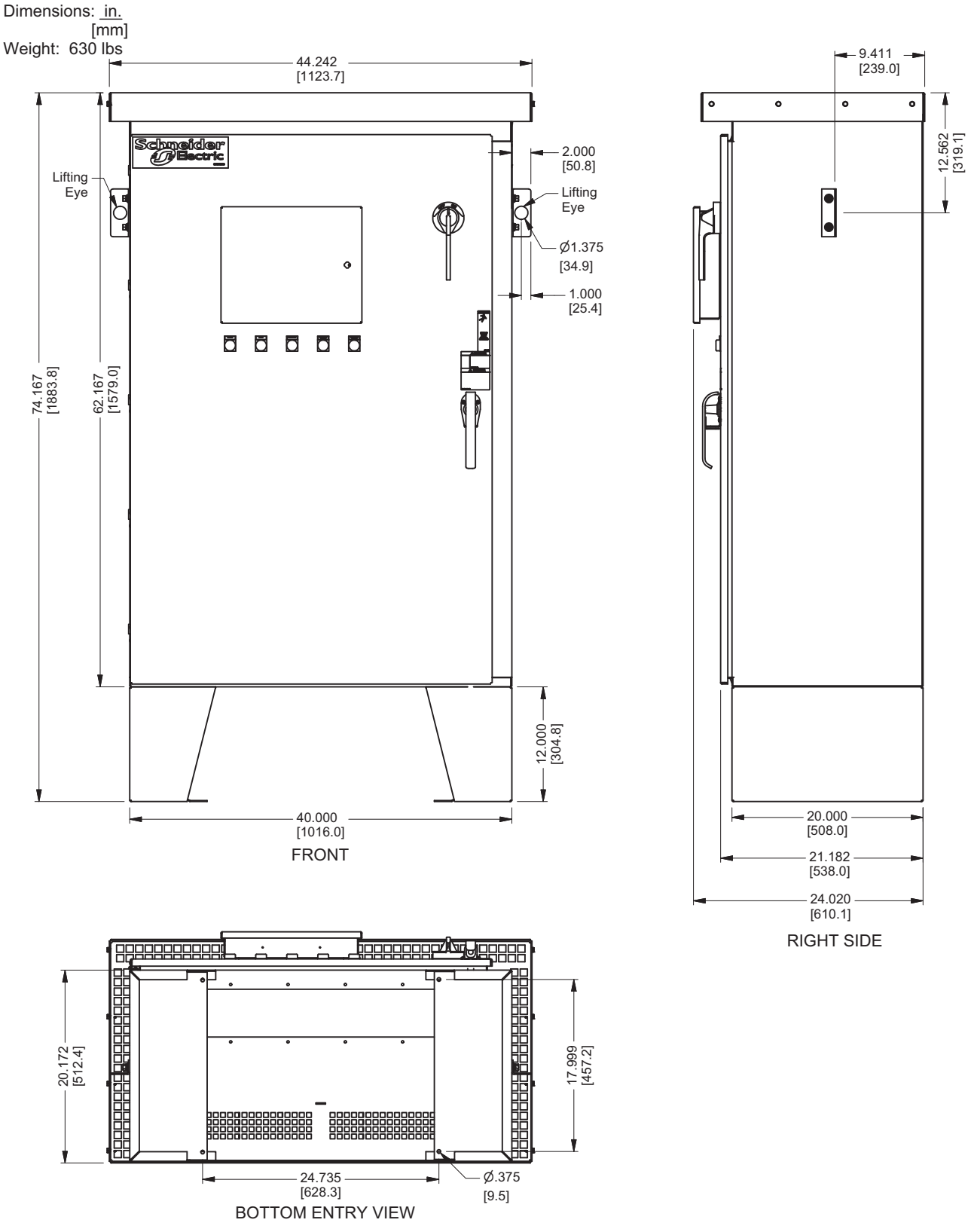
Figure 6: Frame Size 2 Enclosure



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Section 3—Receiving, Installing, and Starting the Condenser Fan Pak

Preliminary Inspection

⚠ CAUTION

DAMAGED CONTROLLER EQUIPMENT

Do not operate any unit that appears damaged.

Failure to follow these instructions can result in injury or equipment damage.

Thoroughly inspect the unit before storing or installing it. Upon receipt:

1. Remove the unit from its packaging and visually inspect the exterior for shipping damage.
2. Confirm that the catalog number on the unit nameplate matches the catalog number on the packing.
3. If you find any shipping damage, notify the carrier and your Schneider Electric sales representative.

Before installation:

1. Turn the circuit breaker disconnect handle to the Off position and open the door of the unit.
2. Visually verify that all components are properly seated, securely fastened, and undamaged.
3. Verify that the internal wiring connections are tight.
4. Inspect all connections for damage.
5. Verify that the system voltage matches unit nameplate voltage.
6. Close and secure the unit door.

Storing the Equipment

⚠ WARNING

TOPPLE AND CRUSHING HAZARD

- Do not stack units on top of each other.
- Do not place any material on top of the unit.
- Store or ship the unit in the original packaging.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Storing the unit in its original packaging until it reaches its final installation site helps protect the equipment and prevent damage to the exterior.

- If you plan to store the CFP after receipt, replace it in its original packaging and store it in a clean, dry area where the ambient temperature is between -13 to +149 °F (-25 to +65 °C).
- If you ship the CFP to another location, use the original shipping material to help protect the unit.

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Unpacking the Unit

⚠ WARNING

HEAVY EQUIPMENT

- Lifting the unit requires a lifting apparatus.
- Always use safe lifting practices.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- Handle the unit carefully to avoid damage to the internal components, frame, or exterior.
- Lift the unit out of its shipping carton with a suitable lifting apparatus and place it on a flat surface.

Lifting the Unit

⚠ WARNING

HANDLING AND LIFTING HAZARD

- Keep the area below any equipment being lifted clear of all personnel and property.
- Lifting the unit requires a lifting apparatus. Use the lifting method shown in Figure 7 on page 23.
- Before lifting the unit:
  - Inspect the lifting plates, holes, slots, and eyebolts for any damage.
  - Attach a spreader bar as shown in Figure 7.
  - Spreader bar must extend beyond width of unit as shown in Figure 7 to prevent straps or chains coming in contact with top hood of unit.
  - Keep the lifting force vertical.
  - Limit the sling angle to less than 45º.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

IMPROPER MOUNTING

- Ensure that all mounting hardware is of sufficient size and type for the unit's weight.
- Secure and tighten all hardware.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

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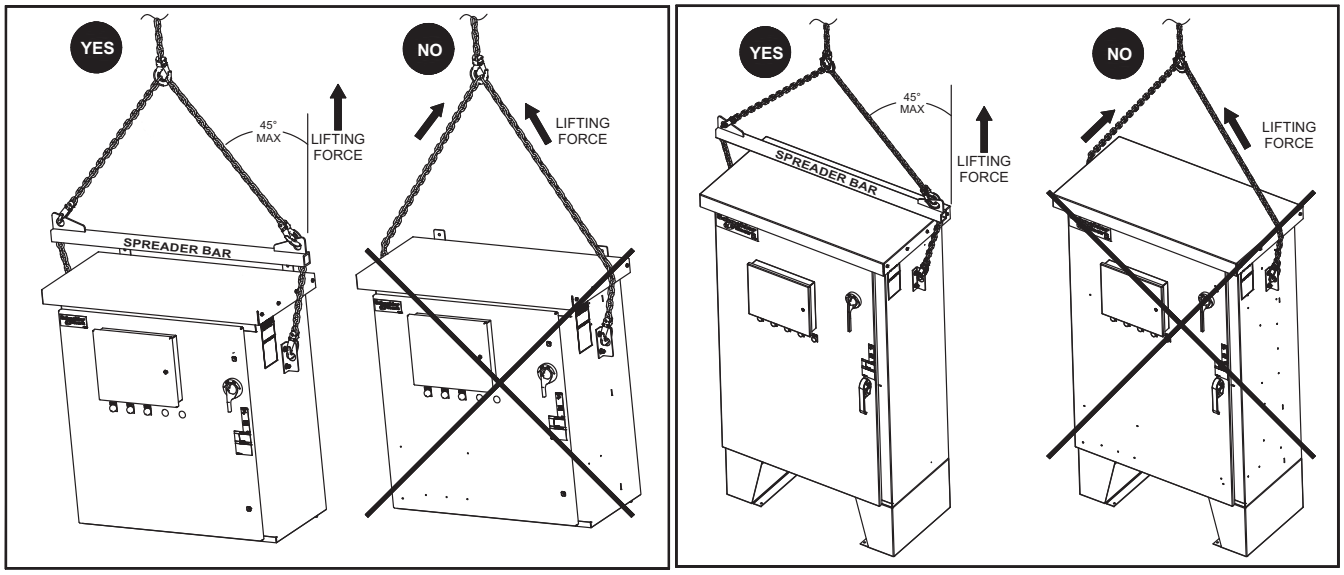
When lifting the CFP:

- Always work with another person. The weight, size, and shape of the unit is such that two people are required to handle it.
- Use cut-resistant gloves.
- Attach a spreader bar to the lifting brackets on the sides (see Figure 7) and hoist the unit with chains or straps. The spreader bar must extend beyond width of unit to prevent chains or straps from contacting top hood of unit. See Figure 7 for the proper hoisting method.
- Raise the unit from a horizontal position (the back of the controller resting on a pallet, if shipped in that manner) to the vertical, upright position.
- The bottom of the Size 1 CFP unit has a mounting flange which prevents the unit from standing in a vertical position. If the unit is rested on the mounting flange, the mounting flange may be damaged and/or the unit may tip over.

Figure 7: Lifting the CFP



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Physical Installation

Observe these requirements when mounting the unit:

- **Size 1 CFP:** Mount the Size 1 CFP unit onto a flat, rigid, noncombustible vertical surface, capable of supporting the weight of the unit. The CFP Size 1 unit has four (4) welded mounting tabs, two on the top and two on the bottom. Use fasteners rated for the unit's weight, the expected shock and vibration of the installation, and the expected environment. See Figure 5 on page 18 for unit weight and mounting tab dimensions.
- **Size 2 CFP:** Mount the Size 2 CFP unit on a flat, solid surface capable of supporting the weight of the unit such as a concrete pad. The CFP Size 2 unit has two (2) mounting holes in each support foot to bolt or lag the unit onto the mounting pad. Use fasteners suitably rated for the expected shock and vibration of the installation, and the expected environment. See Figure 6 on page 19 for unit weight and mounting hole dimensions.
- If drilling for conduit entry, take care to prevent metal chips from falling on parts and electronic printed wiring boards.
- Use water-tight rated conduit hubs to make connections between the conduit and the UL Type 3R enclosures.
- Do not obstruct air intake on units.

Electrical Installation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power (main and remote) before installing the equipment.
- Read and understand the precautions in Before You Begin starting on page 8 before performing the procedures in this section.

Failure to follow these instructions will result in death or serious injury.

General Wiring Practices

⚠ CAUTION

IMPROPER WIRING HAZARD

Follow the wiring practices described in this document in addition to those already required by the National Electrical Code and local codes.

Failure to follow these instructions can result in injury or equipment damage.

Before wiring the unit, perform the DC Bus Voltage Measurement Procedure on page 32. Good wiring practice requires the separation of control circuit wiring from all power wiring. Power wiring to the motor(s) must have the maximum possible separation from all other power wiring and from other drives:

- Do not run power and control wiring in the same conduit.
- Do not run motor leads from different VFDs in the same conduit.
- Each motor circuit set of leads must be run in a separate conduit even if the motors are controlled by a common VFD.

This separation reduces the possibility of coupling electrical transients from power circuits into control circuits or from motor power wiring into other power circuits.

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When wiring the unit:

- Before applying power ensure that the wiring termination points are checked for proper torque. See Tables 13, 14, and 15 on pages 39 and 40 for torque values.
- Use metallic conduit for all unit wiring (or VFD-rated cable). Do not run control and power wiring in the same conduit.
- Separate metallic conduits carrying power wiring or low-level control wiring by at least 3 inches (76 mm).
- Separate existing, non-metallic conduits, or cable trays used to carry power wiring from metallic conduit carrying low-level control wiring by at least 12 inches (305 mm).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.

Input Power

The unit operates from a three-phase (208 - 230 Vac +/- 10% or 480 Vac +/- 10%) supply connected to the disconnecting means. See Tables 4 and 5 on page 14 for the unit's input voltages and ratings.

Branch Circuit Connections

⚠ WARNING

IMPROPER OVERCURRENT COORDINATION

- Protective devices must be properly coordinated.
- Do not connect the unit to a power feeder whose short circuit capacity exceeds the short circuit rating listed on the unit nameplate.

Failure to follow these instructions can result in death or serious injury.

⚠ CAUTION

EQUIPMENT DAMAGE FROM IMPROPER WIRING

- Do not connect input power leads to the unit's motor output terminals (T1, T2, T3). This damages the controller and voids the warranty.
- Check the power connections before energizing the controller.

Failure to follow these instructions can result in injury or equipment damage.

All branch circuit components and equipment (such as feeder cables, disconnect devices, and protective devices) must be rated for the maximum input current of the unit. Refer to Tables 4 and 5 on page 14 for the unit's input currents.

Connect input power leads L1, L2, and L3 to the input of the circuit breaker disconnect. Refer to:

- Figure 12 on page 36 and Figure 14 on page 38 for location.
- Table 13 on page 39 for lug data and wire size range for input terminals L1, L2, and L3.

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Input Wiring

Size the ampacity of the input power conductors according to the National Electrical Code and applicable local codes, based on each power source for the unit:

- Source #1
- Source #2, if unit has a Bypass circuit option

Source #2 is the collective sum of all the motor circuits connected to the CFP. Under Bypass operation (Source #2), the fan motors are controlled by the existing chiller equipment fan motor controls, not the CFP, while power to the fan motors passes through the CFP but not the VFD.

Grounding

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Ground equipment using the provided ground connection point as shown in Figure 12 on page 36 and Figure 14 on page 38. The unit must be properly grounded before power is applied.
- Do not use metallic conduit as a ground conductor.

Failure to follow these instructions will result in death or serious injury.

Ground the CFP according to the National Electrical Code and all local codes. To ground the CFP:

- Connect a copper wire from the ground bar terminal to the power system ground.
- Verify that the resistance to ground is one ohm or less. Improper grounding causes intermittent and unreliable operation.

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Wiring and Electromagnetic Compatibility

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and over travel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of anticipated transmission delays or failures of the link[1].
- Each implementation must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control* and to NEMA ICS 7.1 (latest edition), *Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems*.

The high frequency equipotential ground connection between the drive, motor, and cable shielding does not eliminate the need to connect the ground (PE) conductors (green-yellow) to the appropriate terminals on each unit. To help accomplish this, follow these guidelines:

- **To avoid communication interference,** grounds between the drive, motor and cable shields must have high frequency equipotentiality.
- **When using shielded cable for the motor,** use a four-conductor cable so that one wire will be the ground connection between the motor and the drive. Size of the ground conductor must be selected in compliance with local and national codes. The shield can then be grounded at both ends. Metal ducting or conduit can be used for part or all of the shielding length, provided there is no break in continuity.
- **When using shielded cable for control signals,** if the cable is connecting equipment that is close together and the grounds are bonded together, then both ends of the shield can be grounded. If the cable is connected to equipment that may have a different ground potential, then ground the shield at one end only to prevent large currents from flowing in the shield. The shield on the ungrounded end may be tied to ground with a capacitor (for example: 10 nF, 100V or higher) in order to provide a path for the electromagnetic interference.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable and also ensure maximum separation between the control cables and any power cables.

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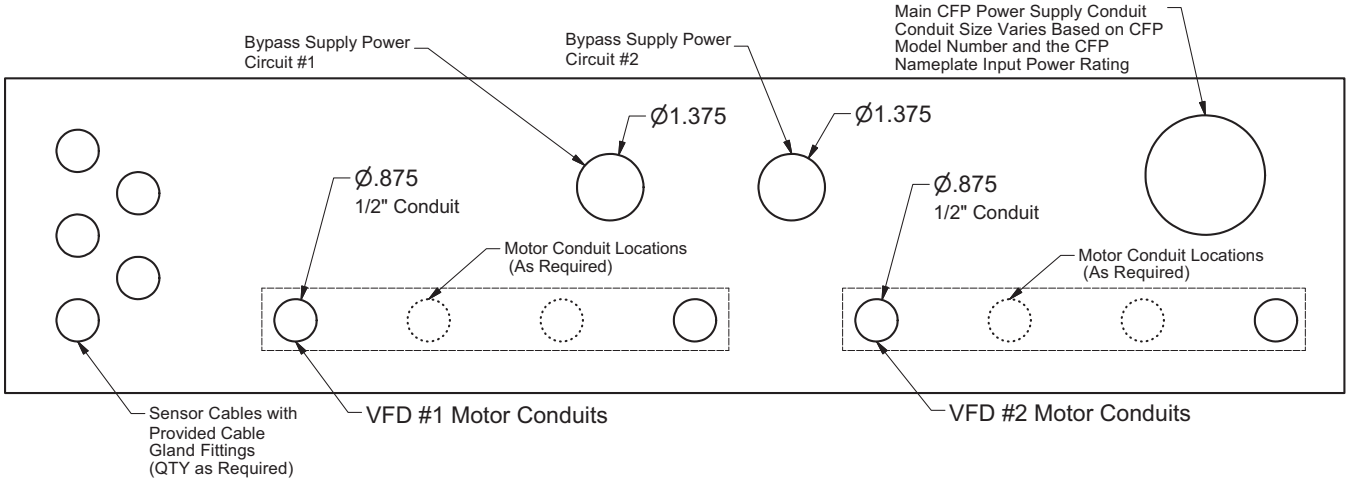
Conduit Entry Location

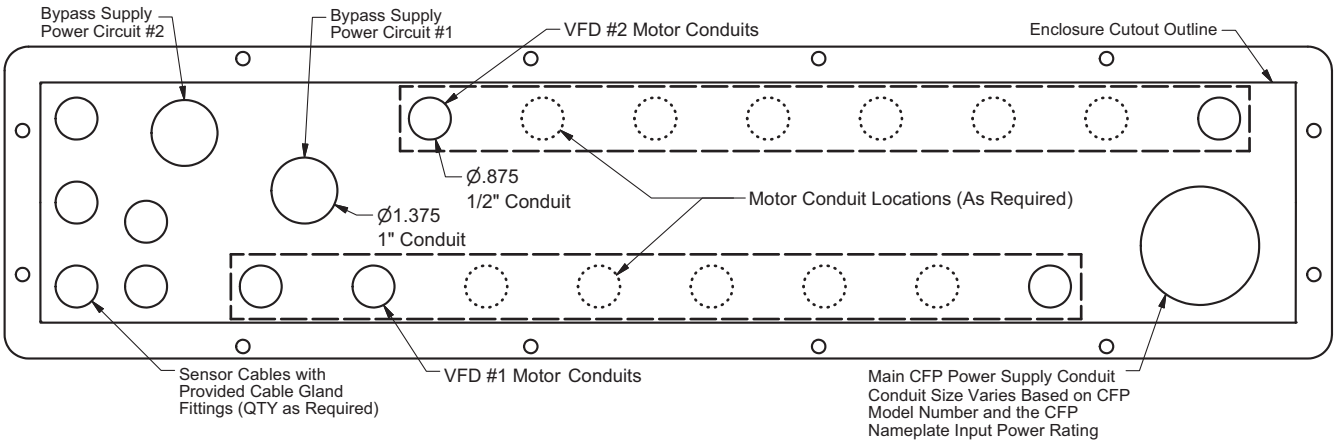
Make conduit entries into the CFP in the enclosure's bottom surface. **Do not make conduit entries in the top or rear surfaces of the CFP.**

Figure 8: Conduit Locations in the CFP Size 1 Enclosure's Bottom Surface


Bypass Supply Power Circuit #1
Bypass Supply Power Circuit #2
Main CFP Power Supply Conduit Conduit Size Varies Based on CFP Model Number and the CFP Nameplate Input Power Rating
Ø1.375
Ø1.375
Ø.875
1/2" Conduit
Ø.875
1/2" Conduit
Motor Conduit Locations (As Required)
Motor Conduit Locations (As Required)
Sensor Cables with Provided Cable Gland Fittings (QTY as Required)
VFD #1 Motor Conduits
VFD #2 Motor Conduits

NOTE: Represents Recomended CFP Size 1 Customer Cut Conduit Entry Locations. Not All Conduit Locations May Be Required.

Figure 9: Conduit Locations in the CFP Size 2 Enclosure's Bottom Surface


Bypass Supply Power Circuit #2
Bypass Supply Power Circuit #1
VFD #2 Motor Conduits
Enclosure Cutout Outline
Ø.875
1/2" Conduit
Ø1.375
1" Conduit
Motor Conduit Locations (As Required)
Sensor Cables with Provided Cable Gland Fittings (QTY as Required)
VFD #1 Motor Conduits
Main CFP Power Supply Conduit Conduit Size Varies Based on CFP Model Number and the CFP Nameplate Input Power Rating

NOTE: Represents Recomended CFP Size 2 Customer Cut Conduit Entry Locations. Not All Conduit Locations May Be Required.

Figures 8 and 9 illustrate suggested conduit entry layouts for Size 1 and Size 2 enclosures that facilitate wiring separation between circuits:

- Control circuits (sensors) and power circuits (supply power, VFD output, and Bypass)
- Different power circuits (supply power, VFD output, and Bypass)
- VFD motor load circuits 1 and 2

Do not coil excess wiring or cables in the bottom of the CFP.

Cut all field wiring to the required length, using wire ties to bundle together all wires of a single circuit (for example: Fan Motor #1 of VFD Circuit #1) and then routing the wiring to provide maximum separation between the circuits.

See Figure 10, Customer Conduit Field Wiring, on page 29 for suggested wire conduit routing.

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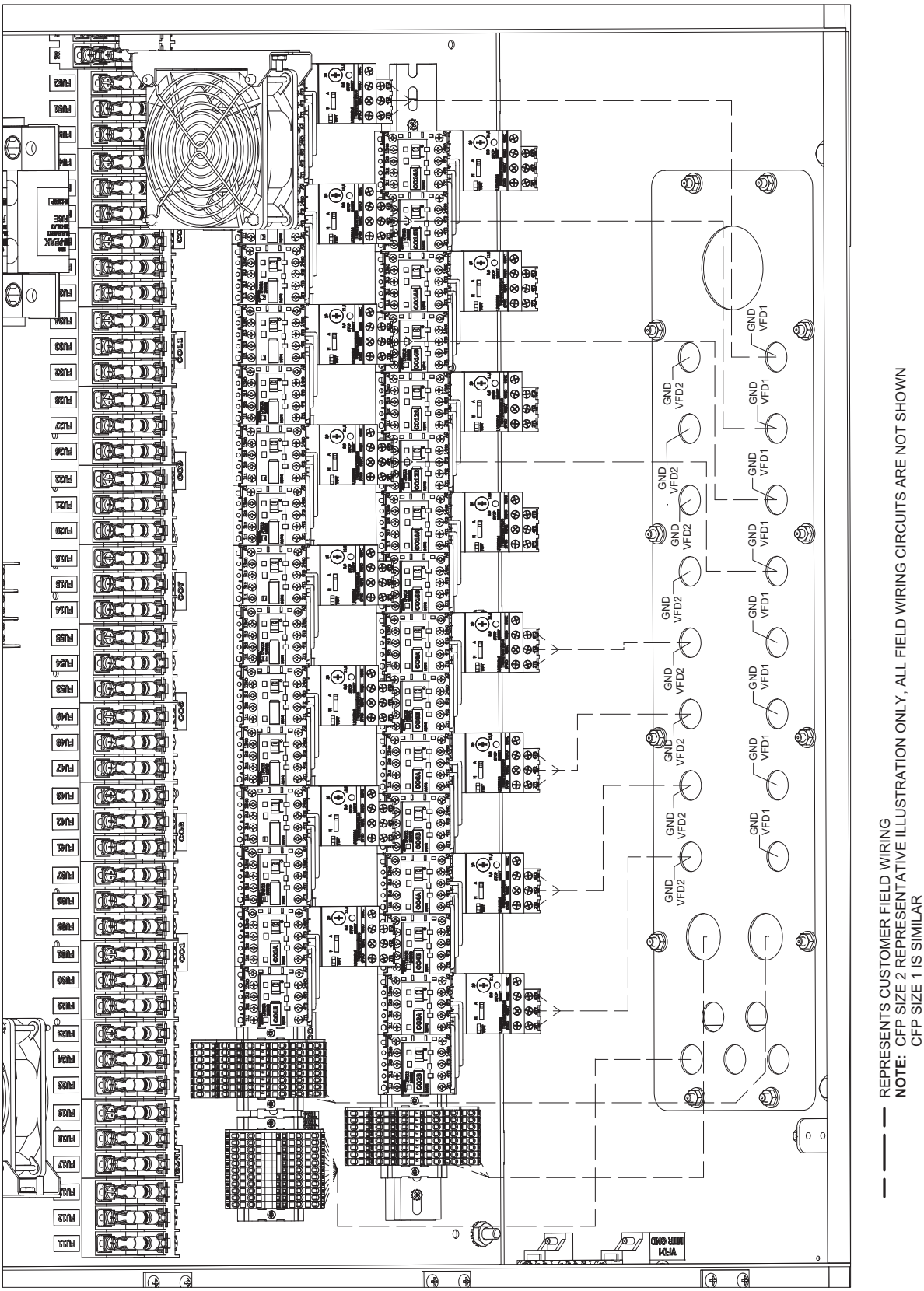
Figure 10: Customer Conduit Field Wiring



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Output Wiring

Size the ampacity of motor power conductors according to the motor full load current, National Electrical Code, and applicable local codes.

Connect the respective motor conductors to the T1, T2, and T3 terminals of the motor overload relay device (one for each motor). Terminate the motor grounds to the respective VFD isolated ground bar.

See Figure 12 on page 36 and Figure 14 on page 38 for location. Refer to the unit wiring schematic for overload relay terminal wire size range and torque requirements.

The VFD is sensitive to the amount of capacitance (either phase-to-phase or phase-to-ground) present on the output power conductors. If excessive capacitance is present, the drive may trip on overcurrent.

Output Cable

Follow these guidelines when selecting output cable:

- **Cable type:** The cable must have a low capacitance phase-to-phase and to ground. Do not use mineral-impregnated cable because it has a very high capacitance. Immersion of cables in water increases capacitance.
- **Cable length:** The longer the cable, the greater the capacitance. Cable lengths greater than 150 ft (50 m) may cause ground faults. For installation where cable capacitances may be a problem, a reactor or motor protection filter can be installed between the VFD and the motor. See Table 7 on page 31 and Table 9 on page 32.

The following guidelines are designed to address maximum cable length for typical drive/motor applications:

- Limits are based on the maximum recommended peak voltage allowed at the motor terminals, which is due to the reflected wave phenomenon. This increase in voltage is primarily determined by the degree of impedance mismatch between the power conductor and the motor in combination of the dv/dt of the specific semiconductors used in the inverter section of the drive feeding the motor, both of which vary depending on the horsepower involved. Many variables can affect the performance of the VFD, the motor, and the cables in long lead applications. Motor protection filters can provide substantial benefits when you are using:
  - 460 V or higher rated AC drives
  - Existing non-inverter duty motors subject to retrofit to an AC drive
  - Shielded cables
- NEMA MG-1 Part 31 compliant motors are recommended but not required. However, it is prudent to consult the motor manufacturer or vendor literature to address any specific limitations governing the application.
  - Consider proximity to other output cables: because of high frequency switching and increased capacitance, the drive may trip under certain conditions.
  - **Do not use lightning arrestors or power factor correction capacitors on the output of the drive.**

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For proper drive short circuit protection, certain values of inductance may be required in the output power wiring. Inductance can be supplied by the power wiring or auxiliary inductors.

Table 7: Maximum Cable Length for Inverter Duty Motors

VFD Rating	Type of Cable	Approximate Length of Motor Cables				
		20 in. to 164 ft. (0.5 to 50 m)	164 ft. to 328 ft. (50 to 100 m)	328 ft. to 492 ft. (100 to 150 m)	492 ft. to 984 ft. (150 to 300 m)	For Longer Lengths
1 - 20 HP	Shielded		1.5% Load Reactor	Motor Protection Filter		Consult your Schneider Electric sales representative
	Unshielded		1.5% Load Reactor		Motor Protection Filter	
25 - 40 HP[1]	Shielded		1.5% Load Reactor		Motor Protection Filter	
	Unshielded		1.5% Load Reactor			

[1] Used in models CF•B88H••••, CF•C66H••••, CF•C88H••••, CF•F66H••••, and CF•F88H••••

Load reactor or motor protection filter must be rated for 6 kHz operation.

VFD Load Filter Determination Work Sheet

1. Determine location of CFP with respect to the condenser fan motors on the condenser equipment.
2. Measure each motor lead length from CFP to the condenser motor for VFD Circuit #1.
3. Enter measurements into Table 8, Motor Lead Length.
4. Sum up the combined motor lead length for all motors in VFD Circuit #1 and enter value on Circuit #1, Total Motor Lead Length, in Table 8.
5. Repeat Steps 2 through 4 for VFD Circuit #2.

Table 8: Motor Lead Length

	VFD Circuit #1 Motor Lead Length, in Feet	VFD Circuit #2 Motor Lead Length, in Feet
Motor 1		
Motor 2		
Motor 3		
Motor 4		
Motor 5		
Motor 6		
Motor 7		
Motor 8		
Total Motor Lead Length:	Circuit #1:	Circuit #2:

If total combined motor lead length exceeds 150 feet (46 m), a load reactor or motor protection filter is required.

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See Table 9 for maximum motor lead length with a VFD load reactor or motor protection filter.

Table 9: Maximum Total Motor Lead Length with VFD Load Reactor or Motor Protection Filter

Motor Cable Type	For Maximum VFD Switching Frequency	Up to 295 ft. (90 m)	Up to 459 ft. (140 m)
Shielded[1]	6kHz	X	
Unshielded[2]	6kHz		X

1 **Exception:** For 25HP (ATVHD18xxx), 30HP (ATV212HD22xxx), and 40HP (ATV212HD30xxx) VFD's, maximum 459 feet (140 m).

2 **Exception:** For 25HP (ATVHD18xxx), 30HP (ATV212HD22xxx), and 40HP (ATV212HD30xxx) VFD's, maximum 951 feet (290 m).

The above footnotes apply to:

- **208—230 V units:** CF•B88H••••, CF•C66H••••, CF•C88H••••
- **480 V units:** CF•F66H•••• and CF•F88H••••

DC Bus Voltage Measurement Procedure

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E®, *Standard for Electrical Safety in the Workplace*.
- Read and understand the DC Bus Voltage Measurement Procedure before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- **Do not** short across capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in this drive, including printed wiring boards, operate at line voltage. **Do not touch**. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

Determine the DC bus voltage level by monitoring the PA/+ and PC/- terminals. The location of these terminals varies by power converter model number. Read the power converter model number on the VFD nameplate. Refer to the ATV 212 installation manual for location of PA/+ and PC/- terminals on the VFD.

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To measure the DC bus capacitor voltage:

1. Observe the lockout/tagout procedures.
2. Remove all external control power that may be present such as on the control board and the option board terminals.
3. Wait fifteen minutes for the DC bus capacitors to discharge.
4. Open the door of the drive.
5. Set the voltmeter to the 1000 Vdc scale. Measure the voltage between the PA/+ and PC/- terminals.
6. Verify that the DC bus voltage has discharged below 42 V before servicing the VFD. If the DC bus capacitors will not discharge below 42 V, contact your local Schneider Electric representative. **Do not operate the drive.**
7. After servicing the VFDs, close and secure door.

Wire Routing and Interconnection

Wire Class

The Wire Class describes the compatibility of the field wiring terminal with the conductor material and insulation system. When used in conjunction with the required conductor current rating and controller ambient temperature rating, the Wire Class forms the basis for selecting a conductor size that limits the temperature on the conductor insulation at the field wiring terminal to acceptable limits. Although it is permissible to use conductors with operating temperatures exceeding those given by the Wire Class, conductor size must fall within the Wire Class limits.

EMI Class

The EMI Class categorizes the electromagnetic properties of the voltages and currents present. The EMI Class comprises of the six categories shown in Table 10:

Table 10: EMI Class Categories

EMI Class	Definition
Quiet Wiring 1 (QW1)	High susceptibility analog and digital control signals. Signals falling under this classification include digital communication/network circuits, controller analog I/O and analog process signals.
Quiet Wiring 2 (QW2)	Medium susceptibility, analog and digital control signals. Signals falling under this classification include 24 Vdc and Vac control circuits.
Standard Wiring 1 (SW1)	Low susceptibility control or power circuits rated less than 600 Vac (250 Vdc) and less than 15 A (voltage and current spectra are generally contained within 0.05-9 kHz). Signals falling under this classification include 120 Vac control circuits.
Standard Wiring 2 (SW2)	Power circuits rated greater than 15 A (voltage and current spectra are generally contained within 0.05-9 kHz). Signals falling under this classification include line power to controllers.
Standard Wiring 3 (SW3)	Reserved.
Pulse Wiring 1 (PW1)	Control or power circuits whose voltage or current spectra significantly exceed 9 kHz. Signals falling under this classification include motor and dynamic braking circuits fed from pulse width modulated (PWM) power converters.

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Voltage Class

The Voltage Class categorizes the voltages present into recognized conductor insulation categories (30, 150, 300, and 600 V) for selection of the conductor voltage rating and physical segregation purposes.

Wiring Methods

Based upon the EMI Class and Voltage Class of the conductors, apply the wiring methods in Table 11 to the drive system. **All motor leads must be run in separate metallic conduits even if the motors are controlled by a common VFD.**

Table 11: Wire Routing and Interconnection

Wiring Methods and Considerations	EMI Class of Conductors				
	QW1	QW2	SW1	SW2	PW1
Conductor Grouping in Wireways/Conduits					
1. Bundle all conductors of 1 or 3 phase AC power circuits to minimize stray magnetic fields.			X	X	X
2. Bundle all conductors of a DC power circuits to minimize stray magnetic fields.			X	X	X
3. When parallel conductors must be run in separate wireways or conduits, bundle conductors into groups that minimize stray magnetic fields.				X	X
4. Maintain conductor runs as short and direct as practical.	X	X	X	X	X
Separation of Circuits					
1. **Do not** run different Noise Class conductors in the same conduit.	X	X	X	X	X
2. **Do not** run different Voltage Class conductors in the same conduit unless all conductors are insulated for the Maximum Voltage Class. present.	X	X	X	X	X
3. Use metallic conduit to individually segregate all PW conductor groups.					X
4. Segregate all conductors by Noise Class. Use the following circuit separation when conductors can run parallel for more that 12 in (305 mm):					
• **Metallic conduit**: 3 in (76 mm) between QW and SW/PW	X	X	X	X	X
• **Metallic tray**: 3 in (76 mm) between SW and PW			X	X	X
• **Metallic tray**: 6 in (152 mm) between QW and SW/PW	X	X	X	X	X
• **Against continuous metal surface**: 3 in (76 mm) between SW and PW			X	X	X
• **Against continuous metal surface**: 6 in (152 mm) between QW and SW/PW	X	X	X	X	X
• **Metallic conduit housing QW:** 12 in (305 mm) to non-metallic conduit SW/PW	X	X	X	X	X
• **Non-metallic conduit:** 3 in (76 mm) between SW and PW			X	X	X
• **Non-metallic conduit:** 24 in (610 mm) between QW and SW/PW	X	X	X	X	X
5. If QW and SW1 wiring must cross SW2 or PW1 wiring, the bundles must cross at right angles.	X	X	X	X	X
Common Mode Noise Issues					
1. Provide adjacent signal returns using twisted pair cable.	X	X			
2. Galvanically isolate signal and associated signal return path when possible.	X	X			
Shielding					
1. Use metallic conduit for all power and control circuits external to the controller enclosure.	X	X	X	X	X
2. Shields should be continuous and equipped with a drain wire.	X	X	X		
3. **Do not** group different Noise Class conductors within the same shield.	X	X	X	X	X
4. Minimize non-shielded portion of conductor at the ends of shielded cable.	X	X	X	X	X
5. When shielding AC or DC power conductors, group conductors to minimize magnetic field in shield.			X	X	X
Grounding					
1. Ground shields only at the controller end.	X	X	X	X	X
2. Use separate ground wire for each shield ground.	X	X	X	X	X
3. Provide a ground wire with all conductor groups whether in tray or conduit.			X	X	X
4. When multiple grounds must be made to a shielded power cable, the shield must have the same short-circuit current rating as the ground conductor in the power cable.			X	X	X
5. Terminate all power grounds and power shield grounds to the controller grounding point or bar.			X	X	X
6. Terminate all signal shield grounds to the terminals provided.	X	X			
7. Always supply a separate equipment-grounding conductor with the controller power feed. **Do not** depend on metallic conduit for ground connection.			X	X	X

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Component Identification and Terminal Strip Locations

Figure 11: Typical Component Identification and Terminal Strip Location, CFP Size 1, Outside View

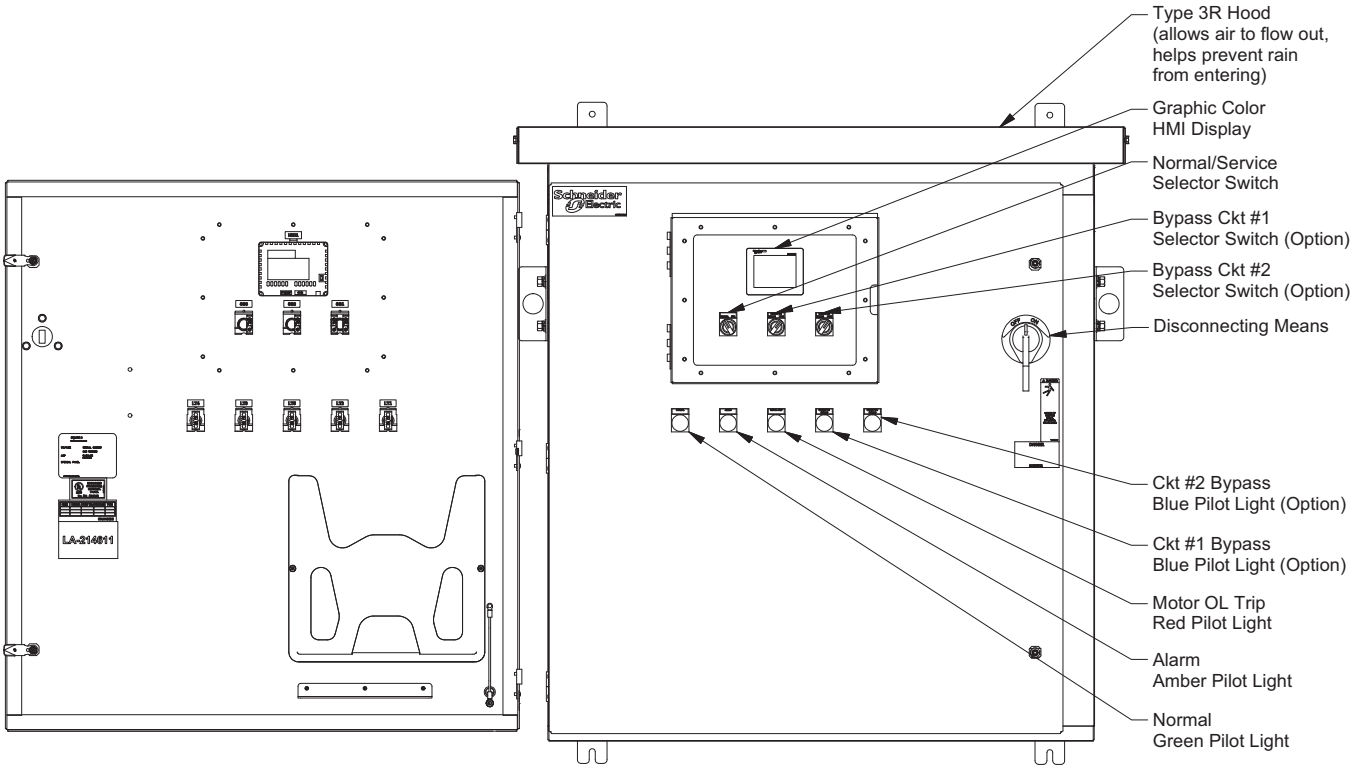
Type 3R Hood
(allows air to flow out, helps prevent rain from entering)
Graphic Color HMI Display
Normal/Service Selector Switch
Bypass Ckt #1 Selector Switch (Option)
Bypass Ckt #2 Selector Switch (Option)
Disconnecting Means
Ckt #2 Bypass Blue Pilot Light (Option)
Ckt #1 Bypass Blue Pilot Light (Option)
Motor OL Trip Red Pilot Light
Alarm Amber Pilot Light
Normal Green Pilot Light
LA-314811
BACK OF MAIN DOOR
OUTSIDE VIEW

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Figure 12: Typical Component Identification and Terminal Strip Location, CFP Size 1, Inside View

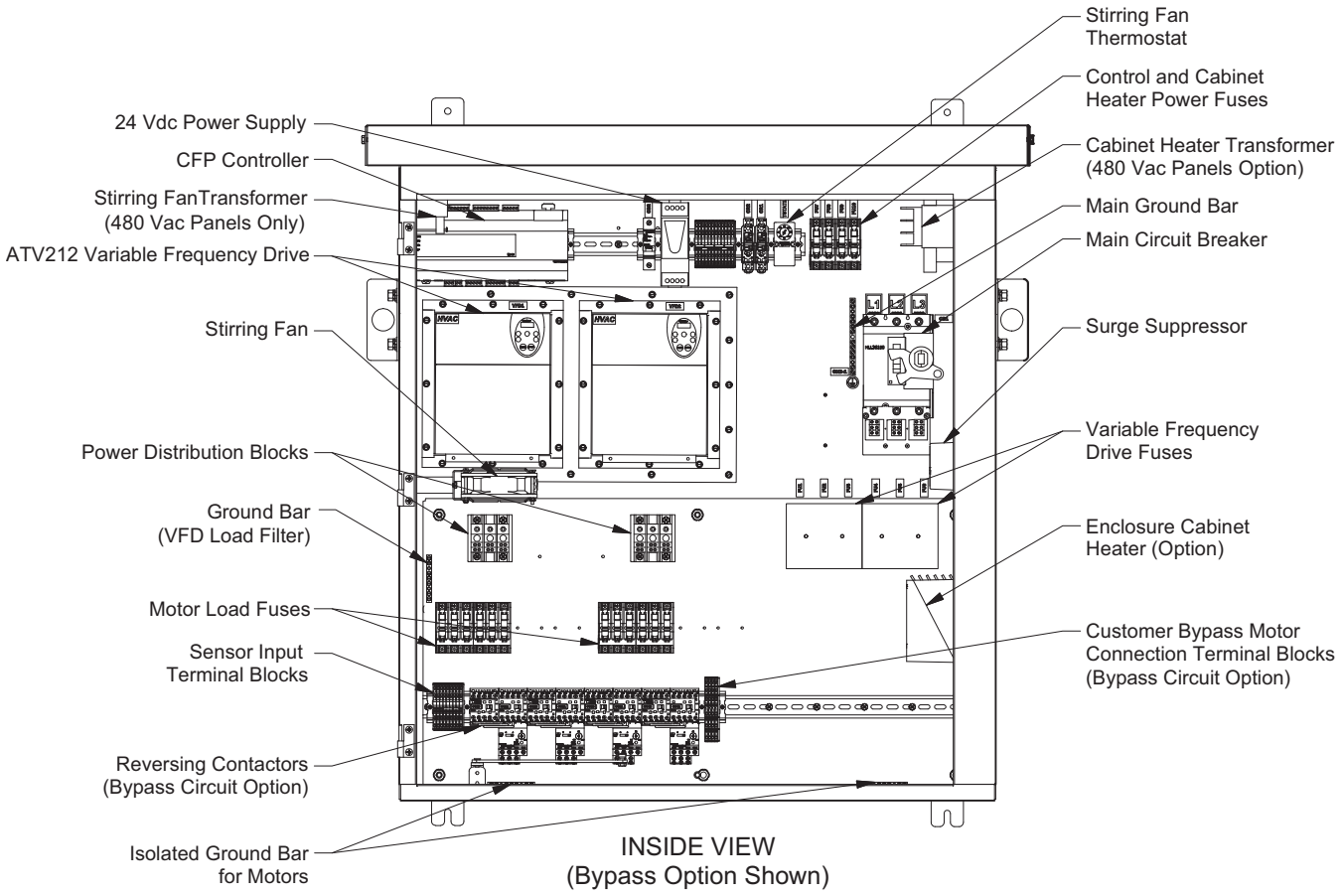
Stirring Fan Thermostat
Control and Cabinet Heater Power Fuses
24 Vdc Power Supply
CFP Controller
Stirring FanTransformer (480 Vac Panels Only)
ATV212 Variable Frequency Drive
Stirring Fan
Power Distribution Blocks
Ground Bar (VFD Load Filter)
Motor Load Fuses
Sensor Input Terminal Blocks
Reversing Contactors (Bypass Circuit Option)
Isolated Ground Bar for Motors
Cabinet Heater Transformer (480 Vac Panels Option)
Main Ground Bar
Main Circuit Breaker
Surge Suppressor
Variable Frequency Drive Fuses
Enclosure Cabinet Heater (Option)
Customer Bypass Motor Connection Terminal Blocks (Bypass Circuit Option)
INSIDE VIEW
(Bypass Option Shown)

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Figure 13: Typical Component Identification and Terminal Strip Locations, CFP Size 2, Outside View

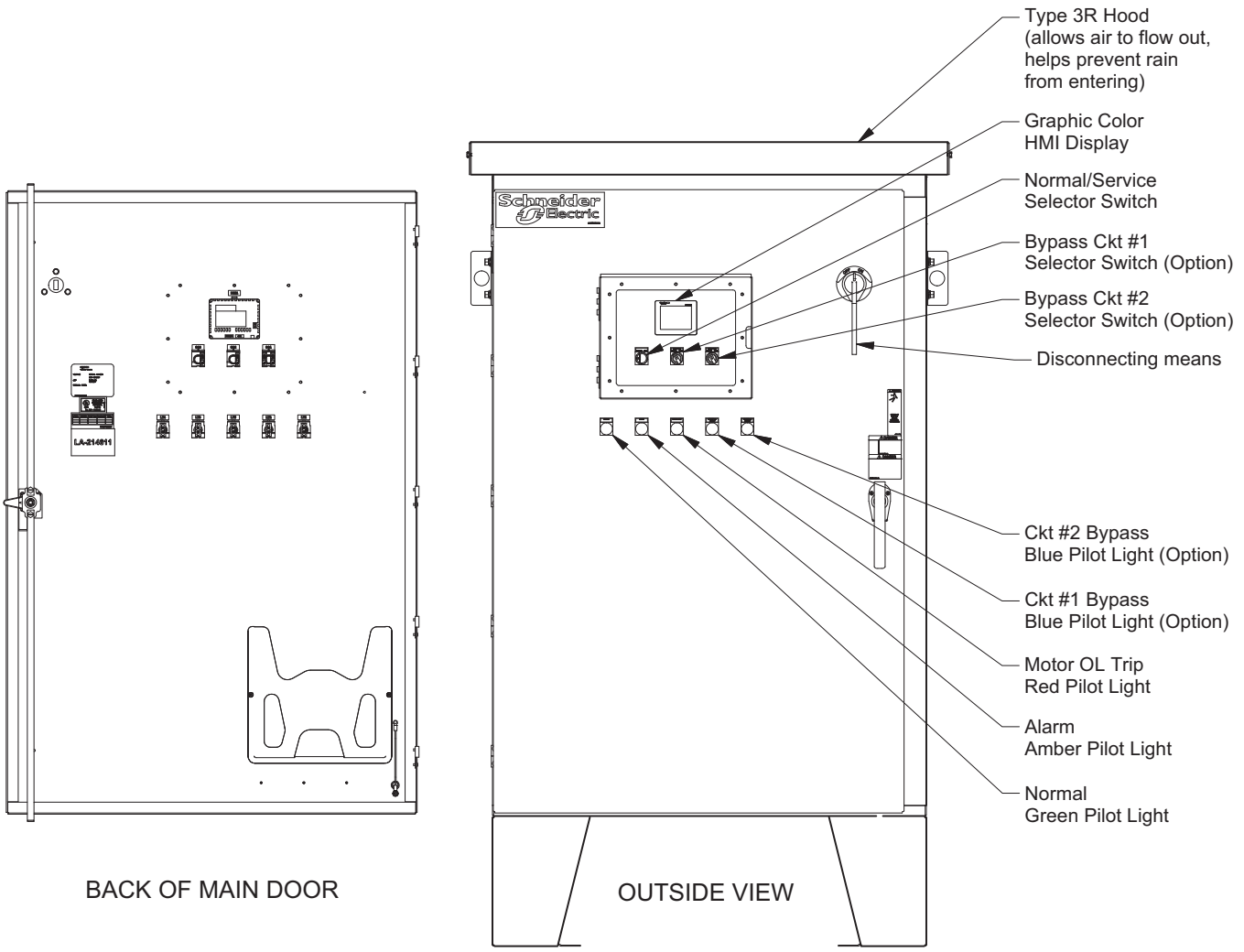

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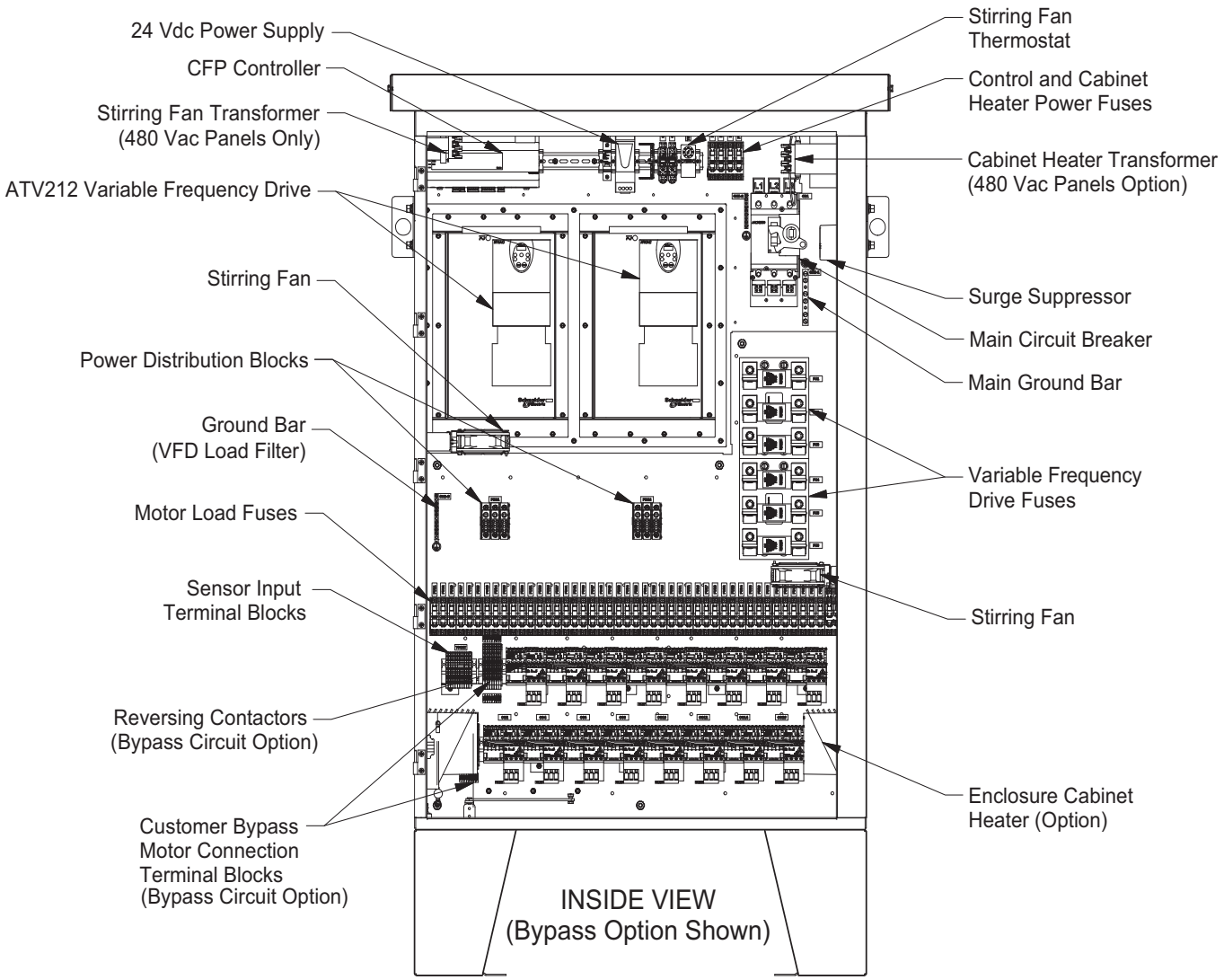
Figure 14: Typical Component Identification and Terminal Strip Locations, CFP Size 2, Inside View


24 Vdc Power Supply
CFP Controller
Stirring Fan Transformer (480 Vac Panels Only)
ATV212 Variable Frequency Drive
Stirring Fan
Power Distribution Blocks
Ground Bar (VFD Load Filter)
Motor Load Fuses
Sensor Input Terminal Blocks
Reversing Contactors (Bypass Circuit Option)
Customer Bypass Motor Connection Terminal Blocks (Bypass Circuit Option)
Stirring Fan Thermostat
Control and Cabinet Heater Power Fuses
Cabinet Heater Transformer (480 Vac Panels Option)
Surge Suppressor
Main Circuit Breaker
Main Ground Bar
Variable Frequency Drive Fuses
Stirring Fan
Enclosure Cabinet Heater (Option)
INSIDE VIEW
(Bypass Option Shown)

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Power Wiring

Table 12: Power Terminal Functions

Terminal	Function
GND	Grounding Bar
L1 L2 L3	3-phase input power supply (at top of circuit breaker)
T1 T2 T3	Output connections to each motor load, load side of motor overload relay
TSx - L1 TSx - L2 TSx - L3	If Bypass option is provided: Bypass terminal strip, TSx, where "x" represents a number 1 through 16. 3-Phase condenser fan motor power from existing chiller fan motor controller device

Table 13: Power Terminal Wire Range and Torque, Copper Wire Only

Model Number	Power Terminals					
	Maximum Wire Size		Terminal Torque lb-in (N•m)	Maximum Wire Size		Terminal Torque lb-in (N•m)
	Qty.	Awg (mm^2)		Qty.	Awg (mm^2)	
	L1, L2, L3 (Line)			Overload Relay Output Terminals T1, T2, T3 (Load)		
CF•C88H••••	**1**	3/0 - 250 (85 - 127)	225 (26)	**1**	14 - 12 (2.1 - 3.3)	7 (0.8)
CF•C66H••••						
CF•B88H••••						
CF•B66H••••						
All Other Models		14 - 10 (2.1 - 5.3)	50 (5)			
		8 - 3/0 (8.4 - 85)	120 (14)			

Table 14: Ground Terminal Wire Range and Torque, Copper Wire Only

Enclosure Frame Size	Ground Terminals			
	Awg (mm^2)	Terminal Torque lb-in (N•m)	Awg (mm^2)	Terminal Torque lb-in (N•m)
	Main Line Supply GND		Motor and Load Filter GND	
Size 1	14 - 10 (2.1 - 5.3)	20 (2.5)	14 - 10 (2.1 - 5.3)	20 (2.5)
	8 (8.4)	25 (2.8)	8 (8.4)	25 (2.8)
	6 - 4 (13.3 - 21.2)	35 (4.0)	6 - 4 (13.3 - 21.2)	35 (4.0)
Size 2	14 - 10 (2.1 - 5.3)	35 (4.0)		
	8 (8.4)	40 (4.5)		
	6 - 4 (13.3 - 21.2)	45 (5.0)		
	3 - 1/0 (26.7 - 53.5)	50 (5.7)		

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Table 15: VFD and Power Distribution Wire Range and Torque for Customer Provided VFD Load Filter, Copper Wire Only

VFD Model Number ATV212••••••	VFD Load Filter Terminals					
	Maximum Wire Size		Terminal Torque lb-in (N•m)	Maximum Wire Size		Terminal Torque lb-in (N•m)
	Qty	Awg (mm2)		Qty	Awg (mm2)	
	VFD Input (R/L1, S/L3, T/L3) and Output (U/T1, V/T2, W/T3) Terminals			Power Distribution block Line Side: L1, I2, L3		
HD22M3X	1	1/0 (53.5)	212 (24)	1	10 - 14 (5.3 - 2.1) 8 (8.4) 6 - 2/0 (13.3 - 67.4)	35 (4) 40 (40.5) 120 (13.5)
HD18M3X HD11M3X		3 (26.7)	40 (4.5)			
HU75M3X HU55M3X		6 (13.3)	22 (2.5)			
HU40M3X		10 (5.3)	11.5 (1.3)			
HD30N4 HD22N4		1/0 (53.5)	212 (24)			
HD18N4 HD15N4		3 (26.7)	40 (4.5)			
HD11N4 HU75N4		6 (13.3)	22 (2.5)			
HU55N4 HU40N4		10 (5.3)	11.5 (1.3)			

Control Wiring

Table 16: Field Wiring Terminal Block Characteristics

TSCNT Terminal	Function	Characteristics
24V	+24 V Control Supply For Field Sensors	Minimum: 21 V; Maximum: 32 V
COM	Common For Field Sensors	0 V
TS+	Outside Air Temperature Sensor Analog Input Signal	0 - 10 Vdc
PS1	Refrigerant Circuit No. 1 High Side Analog Input Sensor Signal	0 - 10 Vdc
PS2	Refrigerant Circuit No. 2 High Side Analog Input Sensor Signal	0 - 10 Vdc
PS3	Refrigerant Circuit No. 1 Low Side Analog Input Sensor Signal	0 - 10 Vdc
PS4	Refrigerant Circuit No. 2 Low Side Analog Input Sensor Signal	0 - 10 Vdc
MTR OL	Motor Overload Trip Status Signal	24 Vdc, N.O.Contact[1]

[1] Provides a signal to be used remotely or locally to monitor if one or more motor overload relays have tripped.

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Initial Start-Up Procedure

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in Before You Begin starting on page 8 before you perform the procedures in this section
- Before working on this equipment, turn off all power supplying it and perform the DC Bus Voltage Measurement Procedure on page 32.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

UNQUALIFIED PERSONNEL

- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting requiring electrical conductors to be energized must comply with NFPA 70 E, *Standard for Electrical Safety Requirements for Employee Workplaces,* and *OSHA Standards-29 CFR Part 1910 Subpart S Electrical*.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Properly ground the unit before applying power.
- Close and secure the enclosure door before applying power.
- Certain adjustments and test procedures require that power be applied to this controller. Extreme caution must be exercised as hazardous voltages exist. The enclosure door must be closed and secured while turning on power or starting and stopping this controller.

Failure to follow these instructions will result in death or serious injury.

The unit has been configured for the installed options and tested at the factory. Depending on the application requirements, minor adjustments may be required to complete the field installation. Follow this initial start-up procedure step by step. In case of difficulty, refer to Section 5, Troubleshooting and Maintenance, beginning on page 71.

Use the door-mounted human machine interface (HMI) to perform the initial start-up procedure.

To perform any programming:

1. Ensure that the enclosure door is closed and secured.
2. Close the equipment disconnect means.
3. Program the HMI.

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Check and Prepare the Equipment

⚠ WARNING

HAZARDOUS MOVING PARTS

Before starting the drive, ensure that the motor and its connected load are clear of personnel and ready to run.

Failure to follow this instruction can result in death or serious injury.

With all incoming power removed, make the following equipment checks:

1. Verify that all equipment disconnects are open.
2. Turn the CFP disconnect handle to the OFF position.
3. Check the wiring of the input power ground and motor grounds. (See the provided unit schematic or control circuit elementary diagram in Section 6, beginning on page 87, for the remote field sensor wiring.) A dedicated sensor wiring terminal block is provided (see Figure 12, page 36; Figure 14, page 38; and Figure 15, page 43).
4. A refrigerant pressure transducer and cable are provided for each refrigerant circuit (high side) monitored by the CFP. Install a pressure transducer onto the high pressure side of each refrigerant circuit with a T connector. This provides easier future servicing. Use a suitable sealant on the refrigerant line threaded pressure transducer connection.

   IMPORTANT: Pressure transducer sensors PS3 and PS4 are needed for CFPs intended for use on chillers with minimum lift requirements (see Differential Pressure on page 54 for additional information). Install the PS3 and PS4 transducer sensors onto the low pressure side of each refrigerant circuit. For chillers with minimum lift requirements, a separate sensor kit must be ordered (Part Number CFMINLIFTKIT).

   The provided pressure transducer cable wiring is color coded:

   — **Brown Wire:** 24 Vdc sensor power (24 V)
   — **Black Wire:** 0 Vdc (COM)
   — **Blue Wire:** Sensor output signal (PSx, where **x** is a number, 1 through 4). See unit schematic for sensor wiring to CFP.

   Sensor cable is suitable for outdoor usage and does not need to be routed within a conduit. Ensure cable routing is suitably protected from mechanical damage and abrasion.

   Separate sensor wiring from all power wiring.

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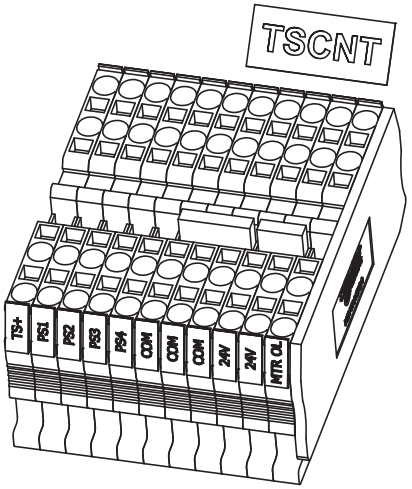
5. Mount the provided outdoor air temperature sensor on the North side of the chiller equipment, away from and outside of the air flow of the chiller's condenser section. Locate the sensor to keep it out of direct sunlight or provide a cover for it. A dedicated sensor wiring terminal block is provided (see Figure 15). Refer to the unit schematic for sensor wiring to CFP.

   Sensor cable is suitable for outdoor usage and does not need to be routed within a conduit. Ensure cable routing is suitably protected from mechanical damage and abrasion.

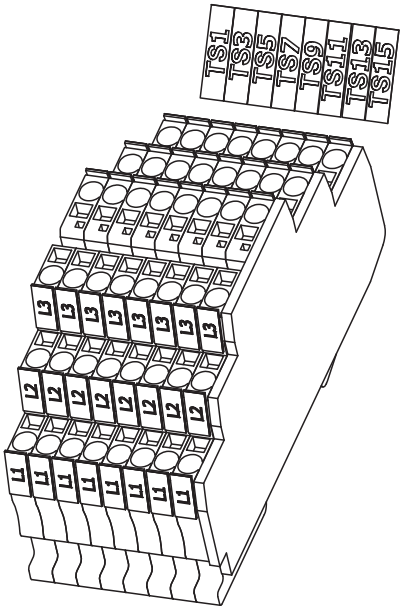
   Separate sensor wiring from all power wiring.

Figure 15: Sensor Wiring Terminal Block



6. Ensure that the condenser fan motor conductors are wired to the T1, T2, and T3 terminals of the respective overload relay (Figure 17). If the CFP is an integral Bypass unit, ensure that the motor controls of the existing chiller equipment are wired to the respective Bypass motor circuit L1, L2, and L3 terminals of the Bypass terminal strip (Figure 16).

Figure 16: Bypass Terminal Strip



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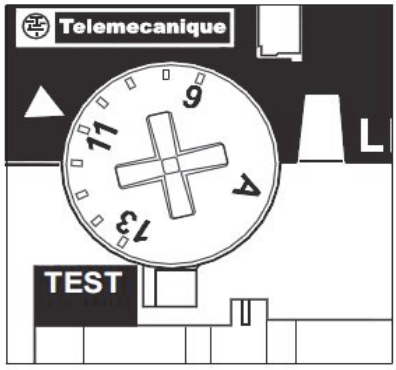
7. Cut sensor cables and field wiring to required length to optimize wire segregation between:
   - — Different power circuits
   - — Power circuits and sensor control wiring

   Do not coil excess wiring or cables in the bottom of the CFP.
8. Set each overload relay dial to the full load ampere rating on the nameplate of the respective connected motor.

   NOTE: The LR2D1516 overload relay is shown in Figure 17. Your dial settings range may be different.

Figure 17: Overload Relay Dial



9. Using a voltmeter set at the 1000 Vac scale, verify that the incoming line voltage at the line side of the disconnecting means is within ± 10% of the input voltage rating on the unit's nameplate.
10. Close and secure the enclosure door.
11. Close the equipment disconnect means. The Normal (green) pilot light lights up.

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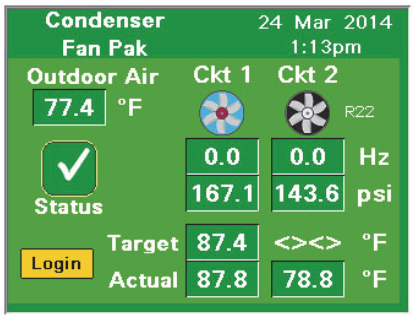
Starting Up the CFP

Log into the CFP

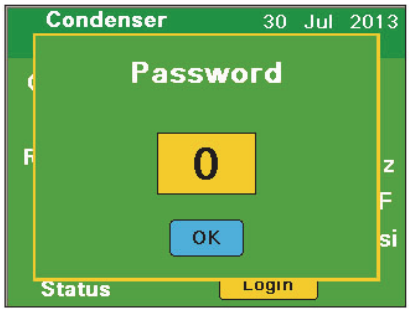
1. The Condenser Fan Pak HMI initially displays the Login screen:

Figure 18: CFP Login Screen



2. Press the **Login** button to bring up the Password screen:

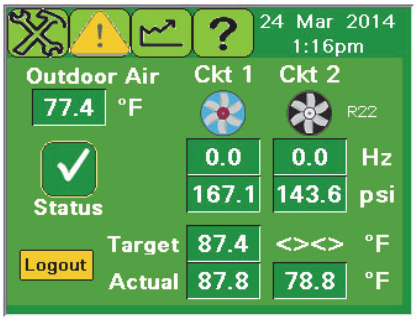
Figure 19: Password Screen



3. The Password field displays a zero. Touch this field to access the touch screen keypad and enter the three-digit password. (The default CFP password is 111.)

   A successful login brings up the Home screen (below). An incorrect password returns you to the CFP Login screen:

Figure 20: Home Screen



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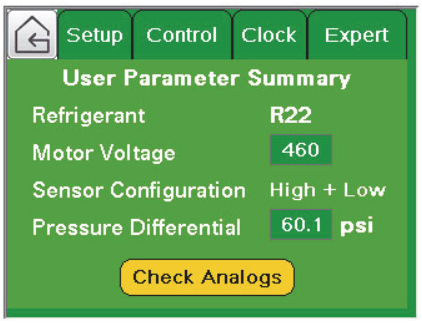
Set User Parameters

1. On the Home screen, press the **Tools** icon (Figure 21) to display the User Parameter Summary screen. This screen shows a summary of the key parameters set by the user:

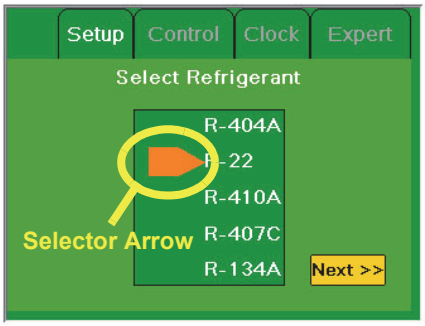
Figure 21: User Parameter Summary Screen



Tools Icon, Home Screen

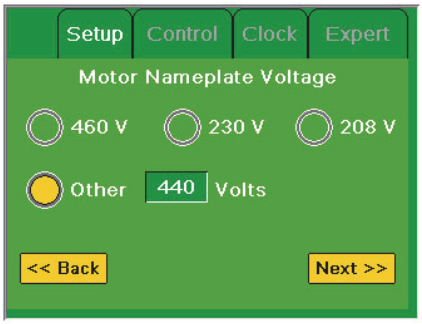
2. Press the **Setup** tab to navigate to the Setup Wizard. The first setup screen is the Refrigerant Selection screen (Figure 22):

Figure 22: Refrigerant Selection Screen



3. Press the selector arrow repeatedly to cycle through the refrigerant choices. Select the refrigerant that corresponds to your chiller.
4. Press **Next >>** to display the Motor Nameplate Voltage screen:

Figure 23: Motor Nameplate Voltage Screen



5. Select the voltage that corresponds to the nameplate voltage of the condenser fans.

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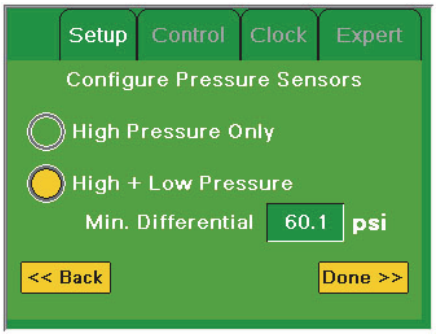
6. Press **Next >>** to display the Configure Pressure Sensors screen:

Figure 24: Configure Pressure Sensors Screen



You can configure the CFP to:

— Measure high refrigerant pressure only.
— Measure both high and low refrigerant pressure.
— Control for minimum pressure differential. (See Differential Pressure on page 54 for additional information on differential pressure control.)

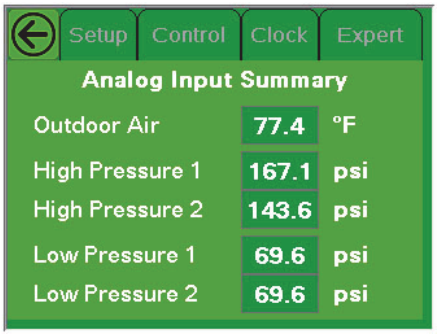
Select the option that corresponds to your CFP.

7. Press **Done>>** to return to the Parameter Summary screen.

Verify Sensor Connections

1. Press the **Check Analogs** button on the User Parameter Summary screen (Figure 21) to display the Analog Input Summary screen (Figure 25):

Figure 25: Analog Input Summary Screen



This screen is provided as an aid to the installer, to help verify that the sensors are connected to the proper inputs in the CFP.

2. Press the back arrow to return to the Parameter Summary screen.

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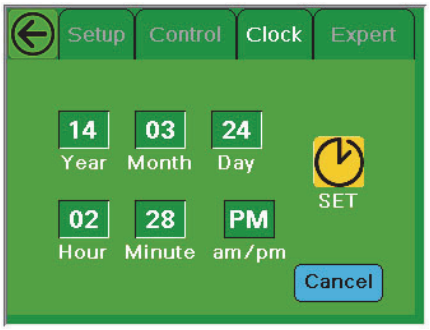
Set System Date and Time

1. Press the **Clock** tab on the User Parameter Summary screen to display the Clock Parameter screen (Figure 26):

Figure 26: Clock Parameter Screen



2. Set the date and time parameters to the current date and time. Press the **SET** button to set the system time. The display reverts to the User Parameter Summary screen after the date and time are set.

Check Fan Rotation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment and perform the DC Bus Voltage Measurement procedure on page 32 before proceeding.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

HAZARDOUS MOVING PARTS

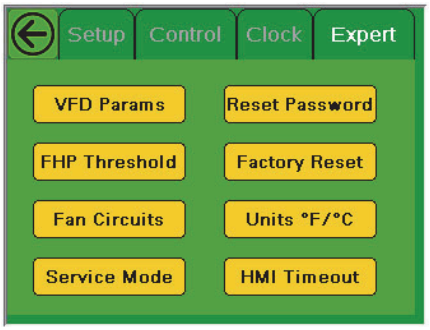
Before starting the drive, ensure that the motor and its connected load are clear of personnel and ready to run.

Failure to follow these instructions can result in death or serious injury.

The CFP can run the fans briefly at low speed to allow the installer to verify that the motor phasing is correct.

1. Press the **Expert** tab on the User Parameter Summary screen to display the Expert Parameter screen (Figure 27):

Figure 27: Expert Parameter Screen



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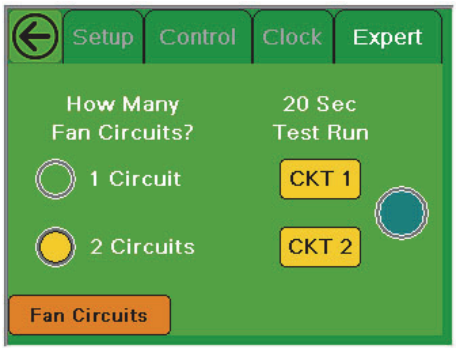
2. Press the **Fan Circuits** button to display the Fan Test screen.

Figure 28: Fan Test



3. Ensure that the fans are clear of equipment and personnel.
4. Press the **CKT1** button. This causes the VFD for Refrigerant Circuit 1 to run the fan motors forward at 20 Hz for 20 seconds.
5. Inspect the fans visually to ensure that all fans are rotating in the proper direction.
6. After the fans have stopped rotating, press the **CKT2** button to repeat the test for Refrigerant Circuit 2.
7. If the fans rotate in the correct direction, proceed to step 9. If the fans do not rotate in the correct direction, **stop the drive and remove all power**.
8. Correct the direction of motor rotation by reversing any two motor leads connected to the motor overload output of the affected motor(s) (see Step 6, page 43, and Figure 17, page 44).
9. Repeat the steps in Check Fan Rotation until all fan motors rotate in the correct direction.
10. To return to the Home screen, press the back arrow until the User Parameter Summary screen displays. Then press the **Home** icon to return to the Home screen.

Check Fan Rotation, Bypass Option

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment and perform the DC Bus Voltage Measurement procedure on page 32 before proceeding.

Failure to follow these instructions will result in death or serious injury.

In Bypass mode, the CFP does not control the fan motors: Power for the fan motors passes through the CFP Bypass contactor contacts to the fan motors. The original chiller equipment fan motor control energizes and de-energizes the condenser fan motors.

1. If Bypass option is provided, momentarily set the Circuit #1 Bypass-VFD selector switch to the Bypass position to check the direction of motor rotation, observe fan rotation, and then return switch to the VFD position.
2. If the fans rotate in the correct direction, proceed to step 6. If the fans do not rotate in the correct direction, **stop the drive and remove all power**.

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3. Correct the direction of motor rotation by reversing any two field-wired motor leads (L1, L2, L3) connected to corresponding Bypass terminal strip within the CFP (see Step 6, page 43 and Figure 16, page 43).
4. Repeat steps 1 and 2 until all fan motors rotate in the correct direction.

After all fan motors for the Circuit #1 Bypass function rotate in the correct direction, repeat steps 1 through 4 for the Circuit #2 Bypass function.

After the fan motor rotation for both Bypass circuits is correct, the Bypass mode motor rotation check is complete: Switch both Bypass-VFD selector switches to the VFD position.

Circuit Breaker Trip Adjustment

For circuit breakers with a J prefix, the instantaneous (magnetic) trip point of the circuit breaker is adjustable and factory set on the Low setting.

CFPs with a J prefix circuit breaker include CF•B66H••••, CF•B88H••••, CF•C66H••••, and CF•C88H••••.

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Section 4—Circuit Descriptions and Options

Introduction

This section describes basic sequences of operation for the two pre-engineered power circuit configurations and their available options:

- Power Circuit without Bypass
- Power Circuit with Bypass

Graphic HMI Display Operation

The graphical HMI display is used for both parameterizing and display. Use the 22 mm operators on the front of the CFP door to command the VFD and Bypass modes of operation.

Type 3R Operation

To help prevent condensation on the inside of the cabinet, leave the mains (Source #1) energized.

Reset After Clearing a Detected Fault

After a detected fault has been cleared, ensure all fan motors are not operating, then power cycle the CFP by switching the main disconnect switch to the OFF position to reset the CFP. **Wait at least one minute before switching the main disconnect switch to the ON position.**

Power Circuit without Bypass

The power circuit without Bypass consists of the following:

- Disconnect switch with means for locking in the open (OFF) position
- Control power supply
- Variable frequency drives
- Individual motor overload relay for each motor
- Optional equipment as specified

Operator Controls: General Arrangement and Operation

The operator controls (HMI, status lights, and switches) are located on the front door of the CFP (see Figure 2 and Figure 3 on page 16).

CFP Operation

To operate the CFP, the disconnect switch must be in the ON position.

Normal Status Light

This green light is on if the CFP is powered on and ready for operation without any detected alarm conditions.

NOTE: The Normal Status Light does not illuminate if the HMI is not in the Home Screen.

Alarm Status Light

This amber light is on if the CFP has detected an abnormal condition.

The alarm status light flashes if either of the following conditions apply:

- CFP is in the Service mode (SVC).
- The controller times out during startup due to failure to initialize both VFDs.

The alarm status light illuminates steadily if any of the following conditions apply:

- Outdoor sensor error is detected
- Refrigerant sensor error is detected
- VFD detected error in either one or both VFDs

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Normal SVC Switch

⚠ WARNING

HAZARDOUS FLYING DEBRIS

- Before activating the service switch, ensure that the area surrounding the condenser coils is clear of personnel.
- Ensure no cleaning solution has been applied to the condenser coils.
- Wear appropriate personal protective equipment (PPE).

Failure to follow these instructions can result in death or serious injury.

Use the normal service switch (SVC) to temporarily run all condenser fans in the reverse direction at full speed. This blows air through the condenser coils, removing any loose debris from the coils prior to their periodic general maintenance cleaning.

Use the service switch function before you apply any cleaning solution to the condenser coils as recommend by the equipment manufacturer. Wear appropriate personal protective equipment (PPE) and ensure that the area surrounding the condenser coils is clear of personnel.

The service switch has a spring return to the Normal position. To activate the service mode:

1. Hold the switch in the SVC position for five seconds (factory default setting).
2. Release the switch.

The condenser fans will then run in the reverse direction for 20 seconds (the factory default setting) at full speed.

Motor Overload

Each motor is provided with thermal motor overload protection through a motor overload relay. If a motor overload relay trips, it must be manually reset by pushing the reset button on the effected motor overload relay (Figure 17, page 44).

Motor OL Trip Status Light

The red status indicator light on the front of the CFP door is an alert that illuminates if any one of the multiple motor overload relays have tripped. Additionally, a 24 Vdc motor overload status signal (MTR OL) is provided at the TSCNT terminal strip for the local or remote monitoring of a fan motor overload trip condition.

Surge Protection

This standard feature provides a suppression path for each mode, line-to-line (L-L), and line-to-ground (L-G). Each mode is individually fused and uses circuitry with thermal cutouts.

Table 17: Hard-Wired Secondary Surge Arresters

Description	Part Number
Secondary Surge Arrester and Surge Protective Device for three-phase systems. 600 Vac phase-to-ground maximum.[1]	SDSA3650D

[1] Do not use on underground systems. Systems must be solidly grounded.

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Power Circuit with Bypass

Includes all of the same functionality as the Power Circuit without Bypass (Power Circuit without Bypass, page 51) and an additional Bypass Option package.

The Bypass Option is provided for the unlikely event that the VFD becomes inoperative. The option consists of:

- **VFD Output and Bypass Contactors** (electrically and mechanically interlocked)
- **Bypass-VFD Selector Switch** for each respective VFD circuit.
- **Bypass Status Light** for each VFD circuit. A blue light illuminates to indicate if the respective VFD circuit is in the Bypass mode of operation.

Bypass VFD Selector

⚠ CAUTION

RISK OF CFP DAMAGE

- Do not change the position of the Bypass-VFD selector switch while condenser fans are running.
- Check motor for desired rotation in both VFD and Bypass mode.

Failure to follow these instructions can result in equipment damage.

This control option provides a door-mounted Bypass-VFD selector switch for each refrigerant circuit.

In VFD mode, the condenser fans are powered by the VFDs. In Bypass mode, control of the condenser fan reverts to the original chiller control.

Bypass Operation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

In Bypass mode of operation:

- CFP does not provide motor short circuit or motor overload protection.
- Motor short circuit and overload protection must be provided by existing chiller motor controls.
- Motor operation for respective VFD circuit is transferred back to the existing chiller equipment motor control.

Failure to follow these instructions will result in death or serious injury.

To control the operation of the motor with line power, ensure that the disconnect switch on the front of the drive is in the closed position and the Bypass-VFD switch is in the Bypass position. When the Bypass-VFD selector switch is set to Bypass, motor operation for the respective VFD circuit returns to the existing chiller equipment motor control.

If the CFP controller becomes inoperable in the VFD operation mode, the CFP automatically switches both VFD circuits to Bypass operation mode. Under this condition, the following visual indications display on the front panel:

- Green POWER status light is illuminated
- Amber ALARM light is illuminated
- Blue BYPASS status light is illuminated
- Bypass-VFD selector remains in the VFD position

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Short Circuit and Overload Protection in Bypass Mode

In Bypass mode, the CFP does not provide motor short circuit and overload protection. This protection must be provided by the existing chiller equipment. In Bypass mode, the condenser fan motor control reverts to the existing equipment control. The fan motor power from the chiller passes through the Bypass contactor within the CFP to the condenser fan.

- **The motor overload relay in the CFP unit only opens the respective VFD motor output contactor, *not* the Bypass contactor.** In Bypass mode, the CFP motor overload may trip due to a sensed motor overload current condition. When this happens, the MTR OL TRIP status light illuminates (Motor OL Trip Status Light, page 52).
- **The connected VFD contactor cannot be energized until its overload relay is manually reset.** When the CFP is switched to VFD operation mode, the cause for any tripped overload relays must be investigated prior to manually resetting the overload relay.

Options

Network Communication Options

CFP provides the following network connectivity options:

- BACnet MS/TP
- BACnet IP
- Modbus TCP

See Appendix D: BMS Variables Register Map on page 111.

Cold Weather Cabinet Heater Option

The Cabinet Heater option includes a transformer (480 V units only), heater fuses, and a thermostatically controlled cabinet heater. One heater is provided for the Size 1 and two heaters for the Size 2 CFP enclosure. Heater(s) are factory set to turn on when the internal temperature of the CFP is below 15°C (60°F).

Differential Pressure

Differential Pressure is the difference between the refrigerant pressure on the discharge side of the compressor (high pressure) and the suction side (low pressure). Some chiller systems require a minimum pressure differential in order to ensure proper function of the oil systems and expansion valves. These are typically, but not exclusively, chillers with screw compressors.

The Condenser Fan Pak with the differential pressure option employs an additional sensor on each refrigerant circuit to measure the low pressure. The control computes the differential pressure and regulates the condenser fans to ensure that the minimum pressure differential is maintained.

Extra sensors are provided as a separate kit, Part Number CFMINLIFTKIT.

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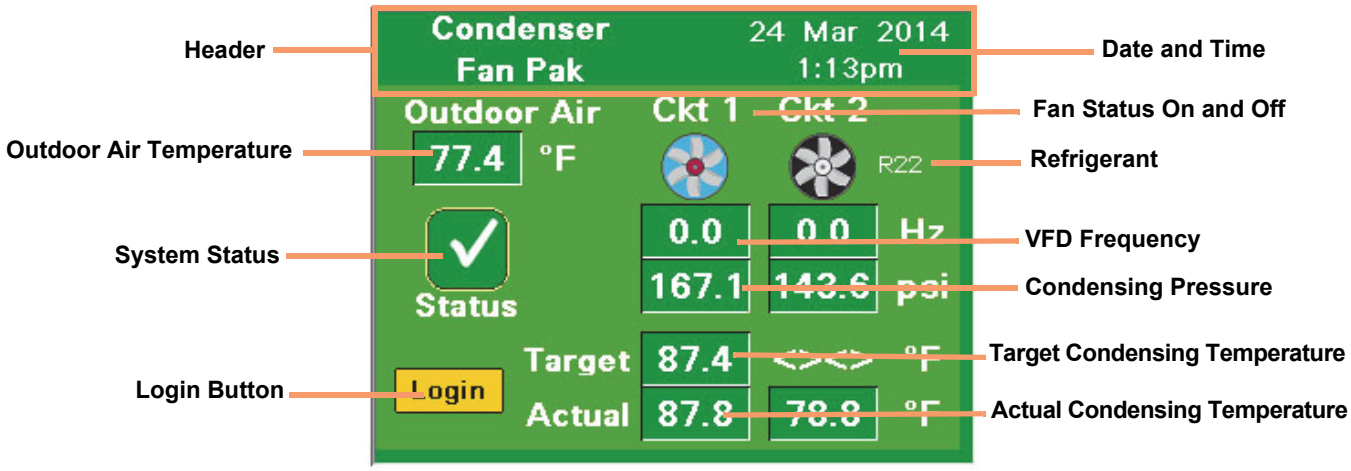
HMI Menu and Settings

CFP Login Screen

Figure 29: CFP Login Screen



The Login Screen is the default CFP HMI screen. It displays current operating parameters as well as a login button that allows a user to log in to the HMI and modify system parameters.

The screen is divided into a header bar and a main display area.

The header bar displays the title (Condenser Fan Pak) and the current date and time, read from the CFP controller.

The following operational parameters are shown in the Login Screen:

- **Outdoor Air:** Reading of the outdoor air temperature sensor
- **Status:** Icon showing control status

Figure 30: System Status Icons

OK
No Fault Detected

Alert
Fault Detected,
System Partly Operational

Alarm
Fault Detected,
System Disabled

- **Login Button:** Brings up the Login Password screen
- **Ckt 1 & Ckt 2:** Fan icons indicating the operational status of the fans: icon animated when the fan is on, static when the fan is off
- **Refrigerant:** Refrigerant-type parameter used in the control
- **VFD Frequency:** VFD output frequency when the fan control is active
- **Condensing Pressure:** Refrigerant condensing pressure, read from the high pressure sensor
- **Target Condensing Temperature:** Target (setpoint) condensing temperature when the control is active
- **Actual Condensing Temperature:** Saturated condensing temperature, calculated from the high pressure sensor reading

See Appendix C: HMI Screens and Default Settings on page 99 for a guide to all HMI screens and their default settings.

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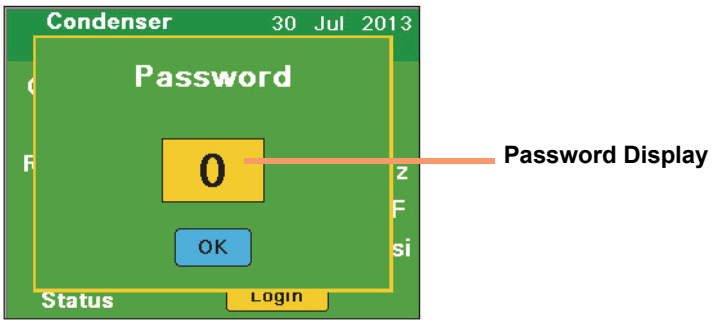
Login Password Screen

The Login Password screen allows the user to enter a password, log in to the CFP, and access user parameters and advanced functions.

Figure 31: Login Password Screen



The password display always initially displays a value of 0 (zero). Press the zero to access the touch screen keypad and enter the password.

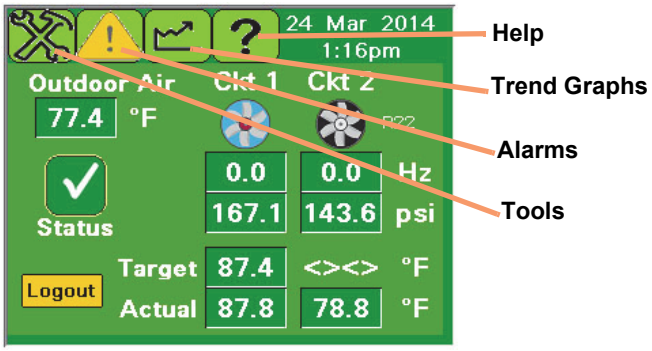
The default password for the CFP is 111.

Entering the correct password takes you to the Home screen; an incorrect password returns you to the CFP Login screen (Figure 29, page 55).

Home Screen

The Home Screen displays the same operating parameters as the Login screen (page 55), but adds four buttons in the Header Bar to allow the user to access additional screens.

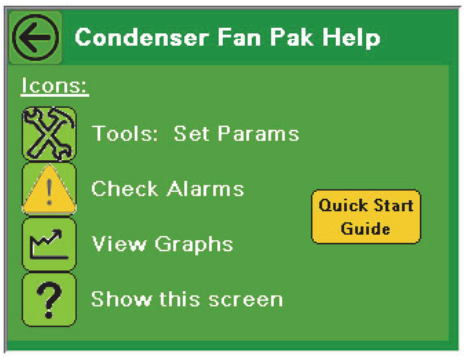
Figure 32: Home Screen



Help Screen

The Condenser Fan Pak Help screen describes the functions of the four main option buttons. It also has a button that brings up the Quick Start Guide.

Figure 33: Help Screen



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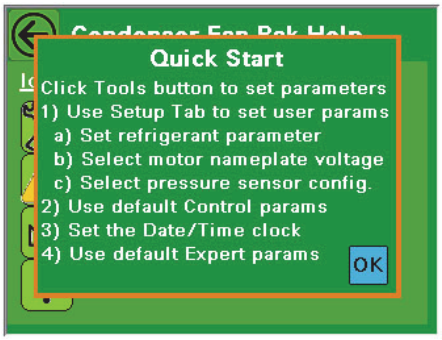
Quick Start Guide

The Quick Start Guide instructs users on configuring the CFP for operation using default parameters.

Figure 34: Quick Start Guide


Quick Start
Click Tools button to set parameters
1) Use Setup Tab to set user params
a) Set refrigerant parameter
b) Select motor nameplate voltage
c) Select pressure sensor config.
2) Use default Control params
3) Set the Date/Time clock
4) Use default Expert params
OK

User Parameter Summary Screen

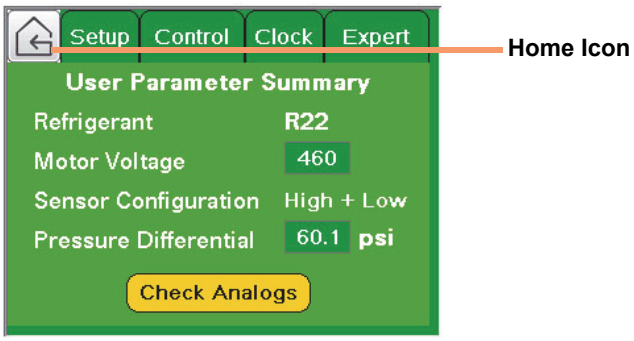
The User Parameter Summary screen displays a summary of the key user-set parameters. It provides tabs to navigate to screens for setting those parameters, as well as a control to display analog sensor input values.

The four key user-set parameters are:

- Refrigerant
- Motor Voltage
- Sensor Configuration
- Pressure Differential

Access the User Parameter Summary screen by pressing the Tools icon in the Help screen (page 56).

Figure 35: User Parameter Summary Screen



- **Setup Tab:** Main user parameters
- **Control Tab:** Control parameters
- **Clock Tab:** Set the system date/time
- **Expert Tab:** Expert parameters
- **Check Analogs:** Values of analog sensor inputs
- **Home Icon:** Return to the Home screen (page 56)

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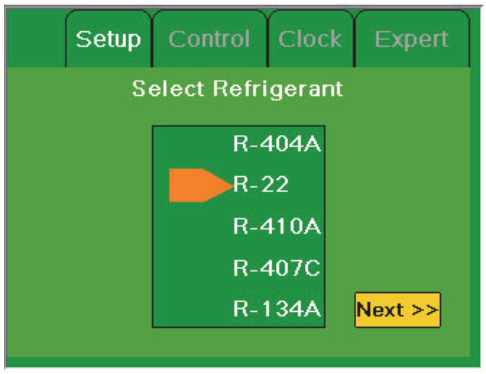
User Parameters: Select Refrigerant

Use the User Parameters Select Refrigerant screen to set the Refrigerant parameter (refrigerant type in use).

Access the Select Refrigerant screen by pressing the Setup tab in the User Parameter Summary screen (page 57).

Figure 36: User Parameters: Select Refrigerant



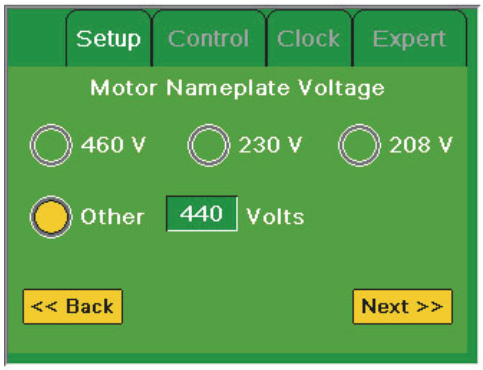
Pressing the screen causes the pointer to cycle through the refrigerant options.

Use the the **Next** button to go to the Motor Nameplate Voltage screen.

User Parameters: Motor Nameplate Voltage

Use the User Parameters Motor Nameplate Voltage screen to set the voltage for the variable speed drives. Three common values are presented as defaults; a non-standard value can be entered using the Other option.

Figure 37: User Parameters: Motor Nameplate Voltage



Use the **Back** button to return to the Refrigerant Selection screen or the **Next** button to go to the Configure Pressure Sensors screen.

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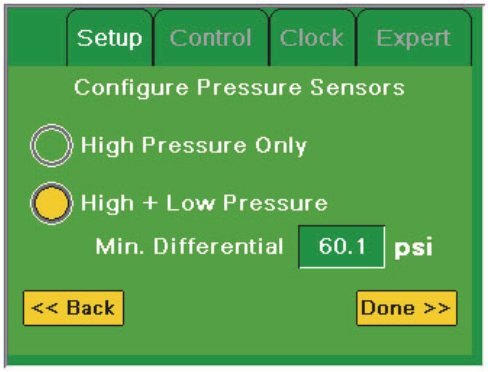
User Parameters: Configure Pressure Sensors Screen

Use the User Parameters: Configure Pressure Sensors screen to configure the CFP to use the pressure sensors on both the high and low pressure sides of the refrigerant circuit or only on the high pressure side.

When you select **High + Low Pressure**, an input field allows you to enter the Minimum Differential Pressure (page 54) parameter.

Figure 38: Configure Pressure Sensors



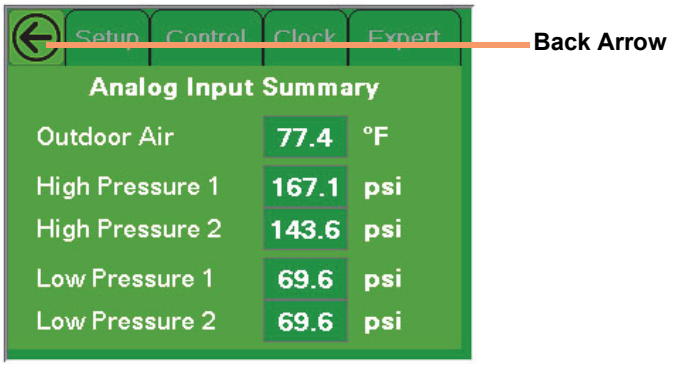
Use the **Back** button to return to the Motor Nameplate Voltage screen, or the **Done** button to return to the User Parameter Summary screen.

User Parameters: Analog Input Summary Screen

The User Parameters Analog Input Summary Screen displays the values measured by all analog sensors connected to the CFP. This screen is an aid to the installer—it verifies that the sensors are connected correctly.

Access this screen by pressing the **Check Analogs** button on the User Parameter Summary Screen (page 57).

Figure 39: Analog Input Summary Screen



Pressing the **Back** arrow returns you to the User Parameter Summary screen (page 57).

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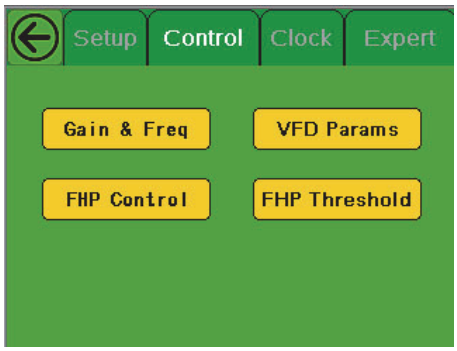
User Parameters: Control Parameters Screen

Four categories of Control parameters are available through the Control Parameters screen:

- Gain and Frequency
- FHP (Floating High Pressure) Control
- VFD Parameters
- FHP Threshold

Access this screen by pressing the **Control** tab on the User Parameter Summary screen.

Figure 40: Control Parameters Screen



Control: Gain and Frequency Screen

The Gain and Frequency screen permits the user to adjust:

- VFD frequency limits
- Parameters for control of fan speed.

Access this screen by pressing the **Gain & Freq** button on the Control Parameters screen.

Figure 41: Gain and Frequency Screen

- **VFD Frequency Limits:**
  - — **Min Freq:** Sets the minimum VFD frequency (default 20 Hz)
  - — **Max Freq:** Sets the maximum VFD frequency (default 60 Hz)
- **Frequency Control Parameter:**

  Max. Freq. Step is the largest frequency change that can take place in one control time step. The control time step is fixed at two seconds.

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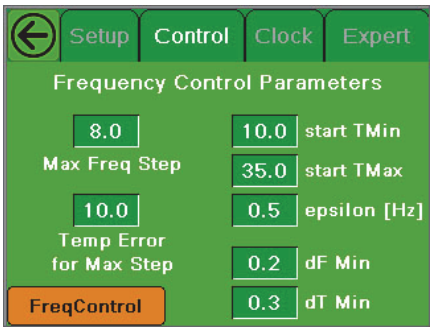
Control: Frequency Control Parameters

The Frequency Control Parameters screen makes it possible to adjust a variety of Frequency Control settings:

- **Max Freq Step:** Largest frequency change that can take place in one control time step (the same as the Gain and Frequency screen, page 60).
- **Temp Error for Max Step:** Temperature error sufficient to cause frequency change equal to Max Freq Step. The actual frequency step is proportional to temperature error.
- **Start TMin, Start TMax, and Epsilon:** These three settings define the initial VFD frequency at startup. Initial frequency varies linearly between the minimum and maximum VFD frequency, depending on outdoor temperature.
- **dF Min, dT Min:** These two settings define the dead band around zero temperature error, where no frequency change is made.

Access this screen by pressing the **Expert** button on the Gain & Freq screen.

Figure 42: Frequency Control Parameters



Press the **Back** arrow to returns to the Gain and Frequency screen (page 60).

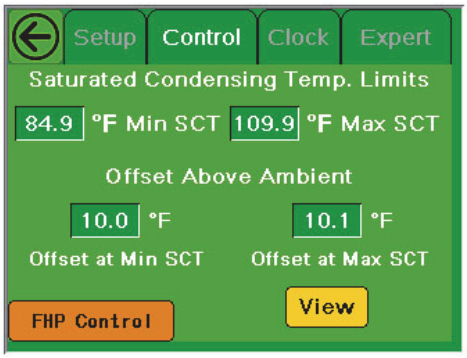
Control: FHP

The FHP Control screen allows the user to specify how the condensing temperature setpoint is calculated relative to the outdoor air temperature.

The first two parameters to be set are the minimum and maximum values of the condensing temperature setpoint, **MinSCT** and **MaxSCT**.

For each of these two values, the user must specify the corresponding offset above ambient air temperature.

Figure 43: FHP Control



Press the **Back** arrow to returns to the Control Parameters screen (page 60).

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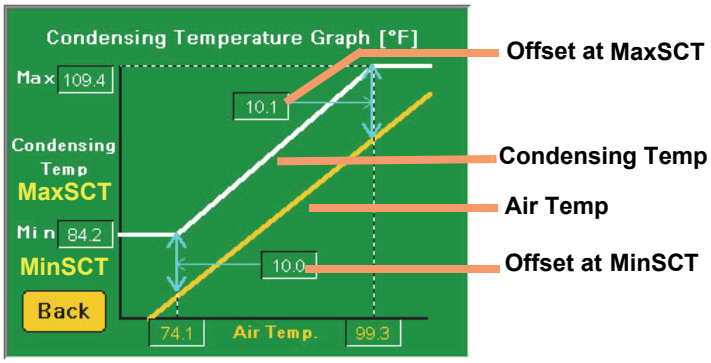
Pressing the **View** button displays a chart showing the condensing temperature characteristics:

Figure 44: Condensing Temperature Graph



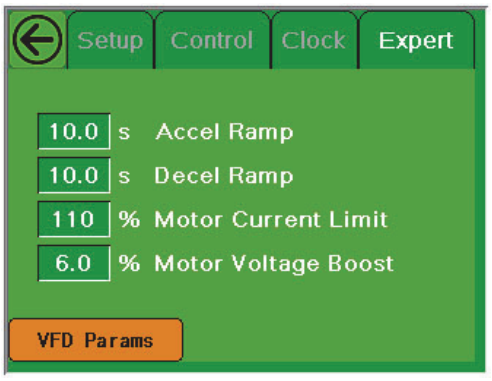
Pressing the **Back** button returns you to the FHP Control screen.

Control: VFD Parameters

Use the VFD Parameters Control to adjust VFD operating parameters:

- **Accel Ramp:** Acceleration rate, defined as the time required for the VFD to ramp the output frequency from zero to maximum frequency (nominally 60 Hz)
- **Decel Ramp:** Deceleration rate, defined as the time for the VFD to ramp down from maximum frequency to zero
- **Motor Current Limit:** The VFD folds back the frequency to limit the current to this percentage of rated current
- **Motor Voltage Boost:** Drive voltage at low output frequency is boosted above a constant V/Hz percentage to aid in motor starting

Figure 45: VFD Parameters Control



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Control: FHP Threshold above Ambient

The two Fan ON-OFF Control Threshold above Ambient parameters control the turn-on and turn-off of the condenser fans:

1. When the chiller is idle, the pressure in the condenser settles at a resting pressure corresponding to ambient temperature. The CFP computes this pressure from the ambient temperature measurement.
2. When the condenser pressure rises above the resting pressure by the amount of the Turn-ON parameter, the control becomes active and operates the condenser fans to regulate the condensing temperature.
3. After the compressors shut off, the condensing pressure drops back to the resting pressure.
4. The CFP control shuts off the fans when the pressure drops to within the Turn-OFF value of the resting pressure.

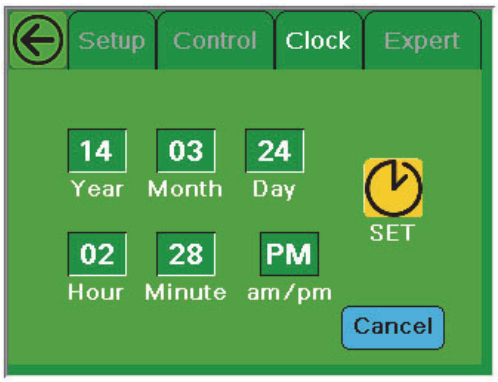
Figure 46: FHP Threshold Control

Control: Clock

Clock Control sets the date and time in the PLC:

- Press the numeric displays to change the date and time.
- Press the **SET** button to set the date/time in the PLC.
- Press the **Cancel** button to cancel.

Figure 47: Clock Control



The Date and Time are displayed on the HMI.

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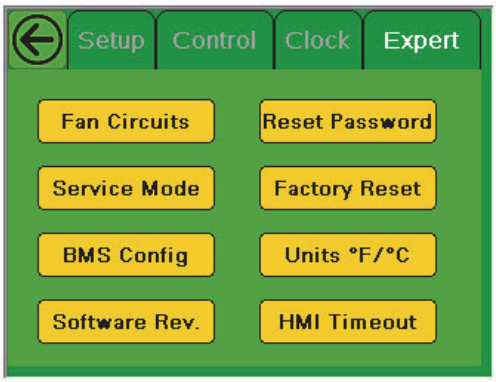
Expert Parameters

The main Expert Parameters screen provides access to eight categories of expert parameters or functions.

Figure 48: Expert Parameters

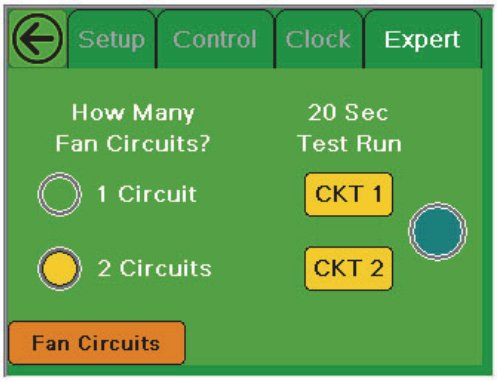


Expert Fan Circuits

The Expert Fan Circuits screen provides two options:

- **How Many Fan Circuits?** The CFP is normally configured for two refrigerant circuits. This option provides the ability to configure the unit for one circuit only. (When this option is selected, only Circuit #1 is enabled.)
- **20 Second Test Run** This feature, provided as an aid to the installer, helps ensure that the condenser fans are connected correctly. Pressing CKT 1 or CKT 2 causes the VFD for the corresponding circuit to drive the fans forward for 20 seconds at 20 Hz. This is sufficient time for the installer to visually verify that all fans of the correct circuit are turning in the correct direction.

Figure 49: Expert Fan Circuits



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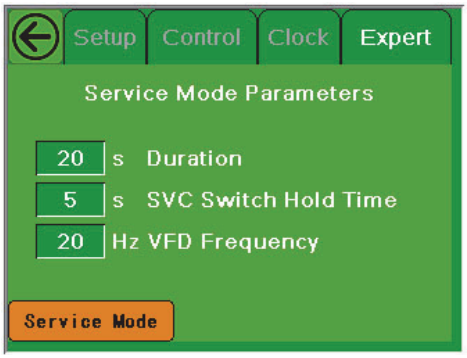
Expert Service Mode

Use the Expert Service Mode screen to adjust the parameters that define the Service mode, in which the fans run backwards for a set period of time.

- **Duration:** Sets the run time, in seconds, of the fans in the service mode
- **SVC Switch Hold Time:** Sets the length of time, in seconds, the operator holds the front panel switch in the SVC position before the fans start
- **VFD Frequency:** Sets fan speed during the SVC mode

Figure 50: Expert Service Mode



Expert BMS Configuration

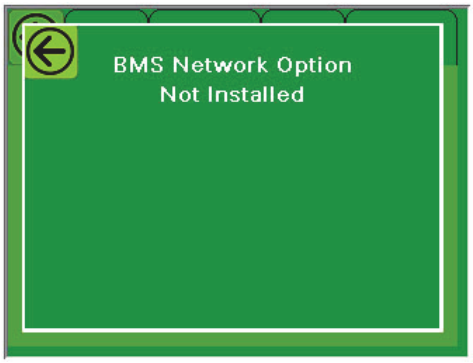
The Expert BMS (Building Management System) Configuration Expert Parameter provides four options for network connectivity in the CFP:

- BMS Network Not Installed
- Modbus TCP/IP
- BACnet IP
- BACnet MS/TP

The HMI displays a configuration screen corresponding to the network option installed in the CFP.

- **BMS Network Not Installed**

Figure 51: BMS Network Not Installed



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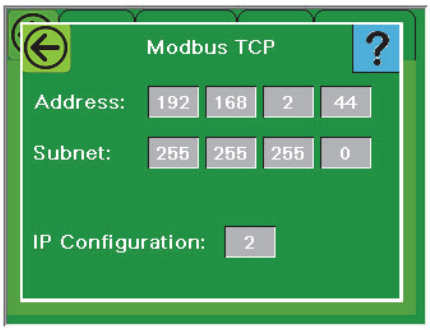
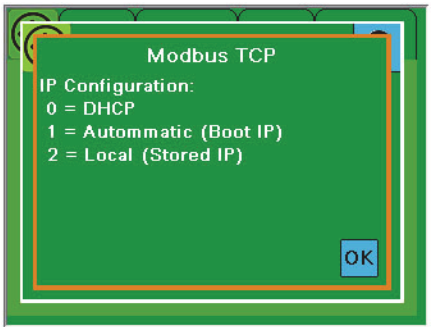
- **Modbus TCP/IP:** Using the Modbus TCP/IP option, you can set three TCP/IP parameters:
  - IP address
  - Subnet Mask
  - IP Configuration

Figure 52: Modbus TCP



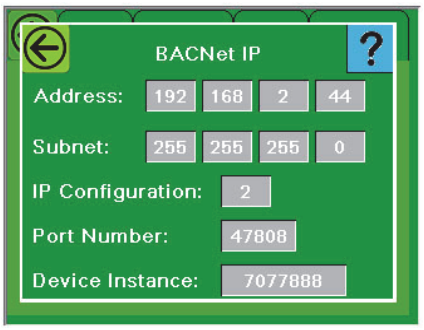
The corresponding Modbus TCP Help screen shows the meaning of the IP Configuration parameter:

Figure 53: Modbus TCP Help



- **BACnet IP:** Using the BACnet IP option, you can set five BACnet IP parameters:
  - IP address
  - Subnet Mask
  - IP Configuration
  - Port Number
  - Device Instance

Figure 54: BACnet IP



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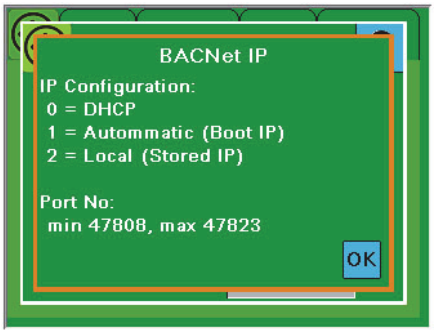
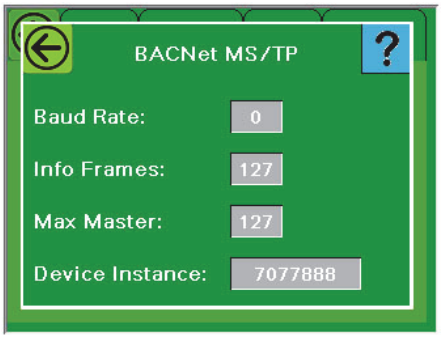
The corresponding BACnet IP Help screen explains the IP Configuration and Port Number:

Figure 55: BACnet Help



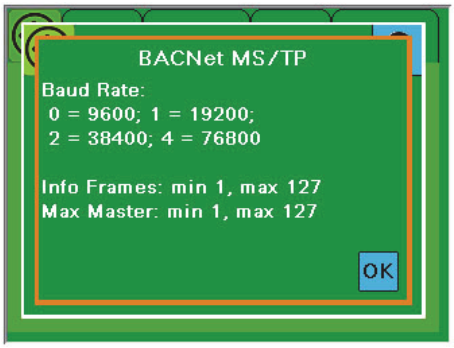
- **BACnet MS/TP:** Using the BACnet MS/TP option, you can set four BACnet MS/TP parameters:
  - — Baud Rate
  - — Info Frames
  - — Max Master
  - — Device Instance

Figure 56: BACnet MS/TP



The corresponding BACnet MS/TP Help screen explains Baud Rate, Info Frames, and Max Master:

Figure 57: BACnet MS/TP Help



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Expert Software Version

The Software Version screen displays the revision numbers of the controller and HMI software:

Figure 58: Expert Software Rev

Expert Reset Password

⚠ CAUTION

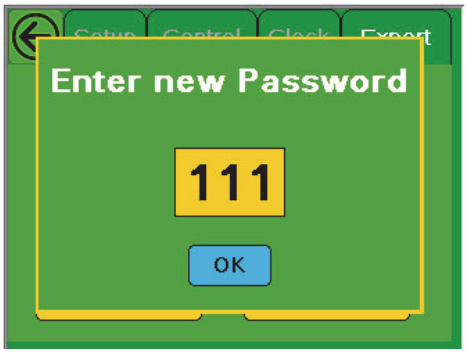
HMI PASSWORD

- Document the new password if changing it from the default setting (111).
- If password is changed and forgotten, contact Product Support (1-888-778-2733) to have the password reset.

Failure to follow these instructions can result in CFP being inoperable.

Press the **Reset Password** button to display the Enter New Password screen. The display shows the current password. Touch the display to bring up a numeric keypad and enter a new three-digit password.

Figure 59: Expert Reset Password



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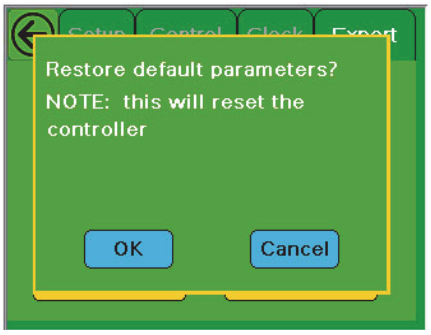
Expert Factory Reset

The Factory Rest screen allows the user to restore factory default parameters. Press **OK** to reset the controller parameters to the factory default values.

When you restore default factory parameters;

- The controller is reset.
- Refrigerant and fan parameters are reset. Go through the Quick Start procedure to reset them.
- The HMI password is NOT reset.

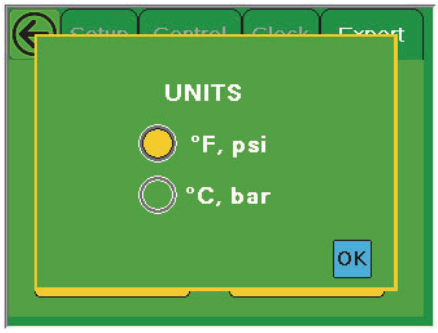
Figure 60: Expert Factory Reset



Expert Units °F/°C

The Expert Units screen provides radio buttons to select the units for parameter display. The default is °F, psi.; the alternative is °C, bar.

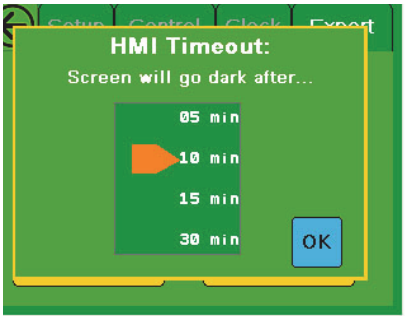
Figure 61: Expert Units °F/°C



Expert HMI Timeout

HMI Timeout automatically logs the user out of the HMI and goes blank after a period of inactivity. Use the Timeout screen to adjust the timeout parameter.

Figure 62: HMI Timeout



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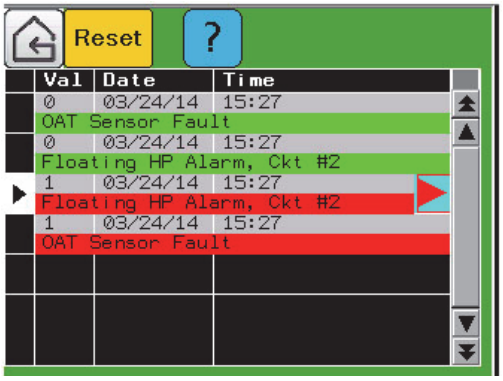
Alarm Log

Pressing the Alarm icon (Figure 63) navigates to the alarm log. The log displays detected faults and gives each fault a date and time.

A fault is displayed in red when it occurs and in green when the fault condition is cleared.

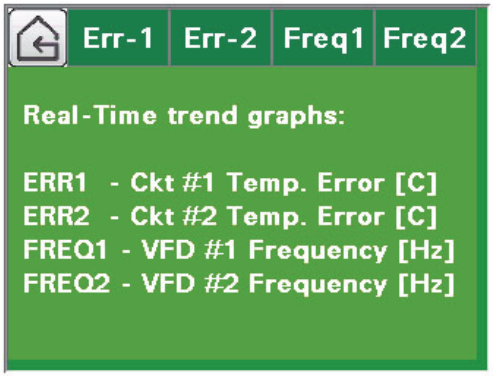
Figure 63: Alarm Log



Trend Graphs

Press the **Trend Graph** icon to display the Trend Graph menu. The tabs at the top of the screen bring up trend graphs of condensing temperature error and VFD output frequency. These graphs can be useful when setting up the CFP and fine-tuning the frequency control parameters.

Figure 64: Trend Graph



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Section 5—Troubleshooting and Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this bulletin in its entirety before installing or operating the Condenser Fan Pak. Installation, adjustment, repair, and maintenance of the CFP must be performed by qualified personnel.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this unit operate at line voltage. **Do not touch.** Use only electrically insulated tools.
- **Do not** short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the CFP, follow the lockout/tagout procedure:
  a. Disconnect all power including external control power that may be present before servicing the CFP.
  b. Place a DO NOT TURN ON label on the CFP disconnect.
  c. Lock disconnect in the open position.
- **Wait 15 minutes** for the VFD DC bus capacitors to discharge. Then follow the DC Bus Voltage Measurement Procedure on page 32 to verify that the DC voltage is less than 42 V. The VFD LEDs are not indicators of the absence of DC bus voltage.
- Disconnect and lock out the Bypass power source if provided.
- Install and close all covers before applying power or starting and stopping the CFP.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E®, *Standard for Electrical Safety in the Workplace*.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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Introduction

A number of diagnostic and status codes are included on the CFP:

- The HMI display provides visual indication of CFP operation (See HMI Menu and Settings, page 55).
- Indicator lights assist in maintenance and troubleshooting (See Bypass Operation, page 53).

If the CFP detects any errors while operating, record the HMI error code(s) before removing power as removing power resets the detected fault code.

External Signs of Damage

The following are external signs of equipment damage:

- Cracked, charred, or damaged covers or enclosure parts
- Damage to the HMI display terminal such as scratches, punctures, burn marks, chemical burns, or moisture in the screen
- Oil or electrolyte on the bottom of the VFD which might have leaked from internal capacitors
- Excessive surface temperatures of enclosures and conduits
- Damage to power or control conductors
- Unusual noise or odors from the equipment
- Abnormal temperature, humidity, or vibration

If any of the above signs are found while the equipment is powered up, immediately inform operating personnel and assess the risk of leaving the CFP unit powered up. Before removing power from the equipment, always consult with the operating personnel responsible for the chiller equipment.

If troubleshooting indicates the need for component replacement, refer to Field Replacement Procedures on page 78.

Fan and Airflow Maintenance

The CFP uses cooling fans. Inspect the interior fans of the CFP for any blockage and impeded rotation of those fans.

To maintain the environmental rating of Type 3R enclosures, periodically inspect the enclosure gaskets for damage.

To maintain proper air flow, periodically check air intake plenum for blockage or debris.

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Preventive Maintenance

Table 18: Recommended Maintenance Intervals

	Interval (years)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Inspection[1]																				
Line side terminals and torque				X				X				X				X				X
Load Side terminals and torque				X				X				X				X				X
Plug-in connections				X				X				X				X				X
Relay contacts						X						X						X		
Circuit boards						X						X						X		
Insulation damage		X		X		X		X		X		X		X		X		X		X
Oxidation, corrosion, dust	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Power supply LEDs				X				X				X				X				X
Gasket						X						X						X		
Circuit breaker inspection				X				X				X				X				X
Heat sinks (dust and debris)		X		X		X		X		X		X		X		X		X		X
Field sensors (oxidation, corrosion, dust)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Change																				
Fan(s) for control electronics				X				X				X				X				X
Fan(s) for power electronics				X				X				X				X				X
Enclosure fans				X				X				X				X				X

[1] All service must be done with the controller in a non-energized state.

Technical Support

When troubleshooting the CFP, discuss the symptoms of reported problems with operating personnel. Ask them to describe the problem: when they first observed the problem and where the problem was seen. If possible, directly observe CFP operation.

For more information, call, fax, or e-mail:

Schneider Electric
Drive Products Support Group
Toll free: 1-888-778-2733
E-mail: drive.products.support@schneider-electric.com
Fax: 919-217-6508

The Drive Products Support Group is staffed from 8 am to 8 pm Eastern time for diagnosis of product problems and advice for the correct course of action. **Emergency startup or breakdown phone support** is available seven days a week, 24 hours a day.

Technical Services (On-Site)

The Schneider Electric Services division is committed to providing quality on-site service that consistently meets customer expectations. Services responds to your requests seven days a week, 24 hours a day.

Toll free: 1-888-778-2733

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Condenser Fan Pak Troubleshooting

When requesting after-sales support or service, it is important to disclose all conditions under which the Schneider Electric equipment currently operates. This helps us diagnose system problems more quickly.

For support or service, call 1-888-778-2733.

Date:	
Contact Name:	
Company:	
Address:	
City:	
State:	
Phone:	
FAX:	

CFP Configuration

Catalog Number (CF••••H•••X):	
Application/Equipment Designation:	

Chiller Equipment Data

Refrigerant Type:			
Compressor Type (Reciprocating, Scroll, or Screw):			
Refrigerant Circuit #1 Total Number of Condenser Fan Motors:			
Condenser Fan Motor: Voltage (3- Phase):	**Frequency:**		**FLA:**
Motor Cable Type:		**Total Length in Feet:**[1]	
Is Motor Designed to Comply with NEMA Mg-1 Part 31 Guidelines?	**Yes:**	**No:**	
Refrigerant Circuit #2 Total Number of Condenser Fan Motors:			
Condenser Fan Motor: Voltage (3- Phase):	**Frequency:**		**FLA:**
Motor Cable Type:		**Total Length in Feet:**[2]	
Is Motor Designed to Comply with NEMA Mg-1 Part 31 Guidelines?	**Yes:**	**No:**	

1 Combined motor lead length of all motors controlled by VFD Circuit 1.

2 Combined motor lead length of all motors controlled by VFD Circuit 2.

Power Source and Environment

Voltage Between: L1 and L2:	**L2 and L3:**	**L3 and L1:**
Ambient Temperatures: Min °C (°F)	**Max °C (°F)**	**Humidity:**
Specify Altitude in Feet if CFP Installed Greater than 3300 Feet above Sea Level:		

Detailed Description of Problem:

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Troubleshooting Guides

Table 19: Troubleshooting Guide

Problem	Cause	Remedy
Amber Alarm Icon	System warning or fault	Inspect alarm log for details. See Table 21 on page 76.
Red Fault Icon	System fault	Inspect alarm log for details. Cycle power to CFP to reset fault.
HMI Blank	HMI is programmed to go blank after ten minutes of inactivity.	Touch the screen.
	Power to HMI disconnected	• Ensure that 24 Vdc power is supplied to HMI. • Check for loose wiring between power supply and HMI.
	HMI is defective	Replace HMI[1]
HMI blank, front panel lights not illuminated	24 Vdc Power supply defective	See Table 20 on page 76.
Front panel amber light flashes during service mode	Flashing amber light normal for user-initiated service mode	Wait for service mode to time out
Front panel amber light flashes at startup	• One or both drives could not be configured. • Probable communications error.	A. Inspect fault log to determine which drive is involved. B. Remove power. C. Verify that Modbus communication cables are connected from controller to the drives. D. Verify that terminating resistor modules are properly seated in the Modbus T connector module. **Terminating Resistor Module** E. Restore power.
Front panel green light goes out when HMI Tools icon is selected	Normal, indicates that the CFP does not respond to high pressure until the user navigates back to the home screen.	Complete parameter entry, then navigate to home screen
Unable to log in to HMI	Forgot password	The default password is 111. If the password has been changed, and you do not know it, contact the Schneider Electric Drive Products Support Group for a reset.
Temperature parameter entered in degrees F, and the HMI sometimes displays a value off by 0.1º	Parameter values are converted internally from Fahrenheit to Celsius. This is a round-off error.	There is no remedy, but the control is not sensitive to parameter changes of 0.1º F.
Pressure parameter entered in psi, and the HMI sometimes displays a value that is off by 0.1 psi.	The parameter values are converted internally from psi to bar. This is a round-off error.	There is no remedy, but the control is not sensitive to parameter changes of 0.1 psi.
VFD keypad blank	VFD not energized	• Ensure disconnect switch is in the ON position. • Check if VFD line fuse is blown.
Motor OL Trip Light illuminated	One or more motor overload relays has tripped	• Ensure motor overload relay is set to motor nameplate FLA. • Ensure motor spins freely and is not obstructed. • Check motor for short circuits or other electrical faults. • Push reset button of motor overload relay to reset motor overload.
Surge protective device (SDS3650D) LED lights not illuminated	One or more LED lights (three total) not illuminated	• Check to see if main circuit breaker is in the ON position. • Check connections. • Verify line voltage at point of connection. If all three check out, replace surge suppressor.

[1] HMI must be replaced with pre-programmed part from factory.

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Table 20: Troubleshooting Guide: 24 Vdc Power Supply

Problem	Cause	Remedy
24 Vdc Power Supply Iout LED is orange. Output current of power supply is at rated output current.	If LED stays orange color for a prolonged period, the 24 Vdc circuit is overloaded.	• Ensure only equipment provided with CFP is connected to 24 Vdc control circuit. • Power cycle power supply.
24 Vdc Power Supply Iout LED is red. Output current limit has been exceeded.	24 Vdc control circuit has been overloaded or short circuit has occurred.	• Check for short circuit. • Ensure only equipment provided with CFP is connected to 24 Vdc control circuit. • Power cycle power supply.

Table 21: Alarm Log Fault Messages

Message	Cause	Remedy
High Pressure Sensor Fault, Ckt #1	• Wiring error • Faulty sensor	• Verify sensor wiring • Replace Sensor
High Pressure Sensor Fault, Ckt #2	• Wiring error • Faulty sensor	• Verify sensor wiring • Replace Sensor
Low Pressure Sensor Fault Ckt #1	• Wiring error • Faulty sensor	• Verify sensor wiring • Replace Sensor
Low Pressure Sensor Fault Ckt #2	• Wiring error • Faulty sensor	• Verify sensor wiring • Replace Sensor
Outdoor Air Temperature (OAT) Sensor Fault	• Wiring error • Faulty sensor	• Verify sensor wiring • Replace Sensor
Handshake Timeout Fault	Communication between HMI and controller	Cycle power
Startup Timeout Fault	Failure to initialize VFDs	Verify VFD configuration. Cycle Power.
VFD #1 Fault	Fault in Modbus link to VFD	Verify integrity of Modbus link
	No power to drive	Verify power circuit
	Faulty drive communication board	Replace communications board
	Faulty drive	Replace drive
VFD #2 Fault	Fault in Modbus link to VFD	Verify integrity of Modbus link
	No power to drive	Verify power circuit
	Faulty drive communication board	Replace communications board
	Faulty drive	Replace drive
Control Wiring Fault	Wiring fault in front panel switches	Check for loose connections or broken conductor wire.
VFD #1 Trip Code	VFD Fault	See Table 22, ATV212 Trip Codes, page 77.
VFD #2 Trip Code	VFD Fault	See Table 22, ATV212 Trip Codes, page 77.

See Appendix A: Renewable Parts on page 93 for correct part replacements for your CFP.

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Table 22: ATV212 Trip Codes

Code	Meaning
0	[No error]
1	[Over-current during acceleration]
2	[Over-current during deceleration]
3	[Over-current during constant speed operation]
4	[Over-current in load at startup]
5	[Short circuit in arm]
	[Input phase failure]
	[Output phase failure]
10	[Overvoltage during acceleration]
11	[Overvoltage during deceleration]
12	[Overvoltage during constant speed operation]
13	[Over-LOAD in inverter]
14	[Over-LOAD in motor]
16	[Overheat trip]
17	[Emergency stop]
18	[EEPROM fault 1] (writing operation)
19	[EEPROM fault 2] (reading operation)
20	[EEPROM fault 3] (other)
	[Speed ref alarm]
21	[RAM fault]
22	[ROM fault]
23	[CPU fault]
24	[Communication error trip]
26	[Current detector fault]
27	[Optional circuit board type error]
28	[Graphic keypad communication error]
29	[Small-current trip]
30	[Trip due to undervoltage in main circuit]
32	[Over-torque trip]
34	[Ground fault trip] (hardware detection)
37	[Overcurrent flowing in element during acceleration]
38	[Overcurrent flowing in element during deceleration]
39	[Overcurrent flowing in element during operation]
41	[Inverter type error]
46	[External thermal input]
47	[VIA cable break]
50	[Break in an analog signal cable]
51	[CPU fault]
52	[Excess torque boost]
53	[CPU fault]
84	[Auto-tuning error]

When troubleshooting ATV212 trip codes, refer to the *ATV212 Programming Manual* (S1A53838) for possible causes and corrective action.

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Field Replacement Procedures

Refer to Appendix A: Renewable Parts on page 93 for the part numbers of the equipment required for the field replacement procedures discussed in this section. For component locations, refer to Figure 12 on page 36 and Figure 14 on page 38.

Field Replacement of the VFD

If the VFD becomes inoperable, it must be replaced. Refer to Table 23 for VFD weights.

Table 23: VFD Weights

Voltage	HP	Part Number	lb	kg
208 – 240 V 3-Phase	5	ATV212HU40M3X	6.74	3.05
	7.5	ATV212HU55M3X	13.48	6.10
	10	ATV212HU75M3X	13.48	6.10
	15	ATV212HD11M3X	25.40	11.50
	20	ATV212HD15M3X	25.40	11.50
	25	ATV212HD18M3X	25.40	11.50
	30	ATV212HD22M3X	60.55	27.40
480 V 3-Phase	5	ATV212HU40N4	7.40	3.35
	7.5	ATV212HU55N4	7.40	3.35
	10	ATV212HU75N4	13.48	6.10
	15	ATV212HD11N4	13.48	6.10
	20	ATV212HD15N4	25.40	11.50
	25	ATV212HD18N4	25.40	11.50
	40	ATV212HD30N4	58.34	26.40

Removing the VFD

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power.
- Before servicing the CFP, follow the lockout/tagout procedure:
  a. Disconnect all power including external control power that may be present before servicing the CFP.
  b. Place a DO NOT TURN ON label on the CFP disconnect.
  c. Lock disconnect in the open position.
- Read and understand the DC Bus Voltage Measurement Procedure on page 32 before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- **Do not** short across DC bus capacitors or touch unshielded components or terminal strip screw connectors with voltage present.
- Many parts in the CFP operate at line voltage. **Do not touch**. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

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⚠ DANGER

ELECTROSTATIC DISCHARGE

Do not subject this device to electrostatic discharge. This CFP contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to follow these instructions can result in injury or equipment damage.

Observe the lockout/tagout procedures.

Observe the following precautions when handling static-sensitive components:

- Keep static producing material (plastic, upholstery, carpeting) out of the immediate work area.
- Store the VFD assembly in its protective packaging when it is not installed in the CFP.
- When handling the VFD assembly, wear a conductive wrist strap connected to the VFD assembly through a minimum of one mega-ohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

To replace the VFD, follow these steps:

1. Turn the disconnect handle assembly to the OFF position and open the door of the CFP.
2. Measure the DC bus voltage as described on page 32 of this manual.
3. Disconnect all power and control wiring from the VFD assembly. Identify each wire for ease when re-assembling the new VFD.
4. Remove the outside flange screws that secure the VFD to the enclosure back wall plate.
5. Remove the VFD from the enclosure.
6. Remove the screws that secure the four (4) VFD mounting flanges (left, right, top, and bottom). These parts are needed for the installation of the replacement VFD.

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Installing the VFD Assembly

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

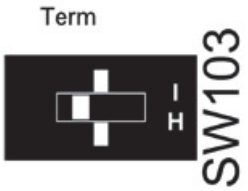
- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting requiring electrical conductors to be energized must comply with NFPA 70 E, *Standard for Electrical Safety Requirements for Employee Workplaces,* and *OSHA Standards-29 CFR Part 1910 Subpart S Electrical*.

Failure to follow these instructions will result in death or serious injury.

To install the new VFD, follow these steps:

1. Attach the mounting flanges removed in previous step onto the VFD.
2. Install the new VFD assembly into the CFP enclosure.
3. Secure the VFD flange assembly to the rear enclosure wall plate using the screws previously removed. Tighten the screws to 20 ± 2 ft-lbs. (27 ± 2.7 N•m).
4. Install all power and control wiring to the VFD assembly terminal blocks.
5. Install all other removed equipment.
6. Tighten VFD terminals to the torque values given in Table 15 on page 40.
7. Check all wiring connections for correct terminations and check the power wiring for grounds with an ohmmeter.
8. Open the VFD front cover and set the Modbus terminating resistor dip switch (SW103) on the VFD printed circuit board to the OFF position.

Figure 65: SW103 Switch



SW103 switch shown in OFF position.

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Applying Power to the VFD and Setting Parameters

After the VFD is installed, apply power and set the operating parameters.

Figure 66: VFD Features

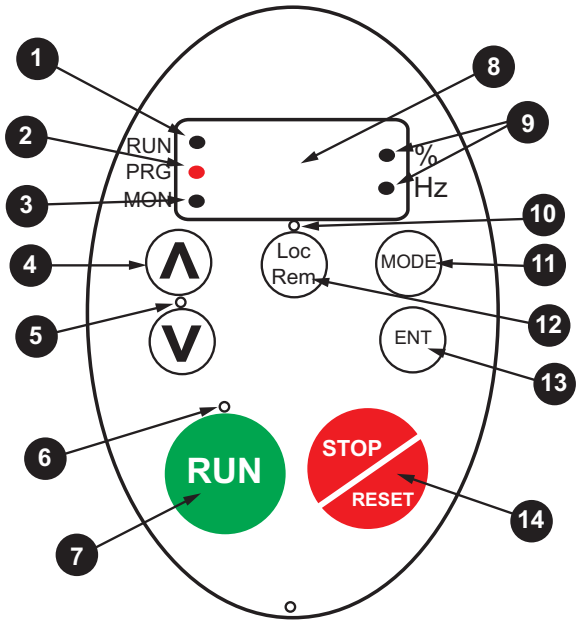

Table 24: Key to VFD Display Terminal Features

	LED/Key	Characteristics
1	**Display RUN LED**	• Illuminates when a run command is applied to the drive • Flashes when there is a speed reference present with a Run command.
2	**Display PRG LED**	• Illuminates when Programming mode is active • Flashes in AUF and GrU modes
3	**Display MON LED**	• Illuminates when Monitoring mode is active • Flashes in detected fault history display mode
4	**UP/DOWN keys**	Depending on the mode, you can use the arrows to: • Navigate between the menus • Change a value • Change the speed reference when the UP/DOWN LED (7) is illuminated
5	**UP/DOWN LED**	Illuminates when the navigation arrows are controlling the speed reference
6	**RUN LED**	Illuminates when the RUN key is enabled
7	**RUN**	Pressing this key when the RUN LED is illuminated starts the drive
8	**Display**	Four digits, seven segments
9	**Display unit LED**	• The % LED illuminates when a displayed numeric value is a percentage. • The Hz LED illuminates when a displayed numeric value is in Hz.
10	**Loc/Rem LED**	Illuminates when Local mode is selected
11	**MODE**	Press to select the embedded display terminal mode: • Run mode (default on power-up) • Programming mode • Monitoring mode Can also be used to return to the previous menu.
12	**Loc/Rem**	Switches between Local and Remote modes
13	**ENT**	Press to display a parameter's value or to save a changed value
14	**STOP/RESET**	Stop/Reset key: • In Local mode, pressing the STOP key causes the drive to stop based on the setting of parameter [Loc. mot stop mode] (F721). • In Remote mode, pressing the STOP key causes the drive to stop based on the setting of parameter [Ext. fault stop Mode] (F603). The display indicates a flashing E If [HMI reset button] (F735) is set to 0. Pressing the stop key twice resets the drive, if the detected fault condition has been cleared.

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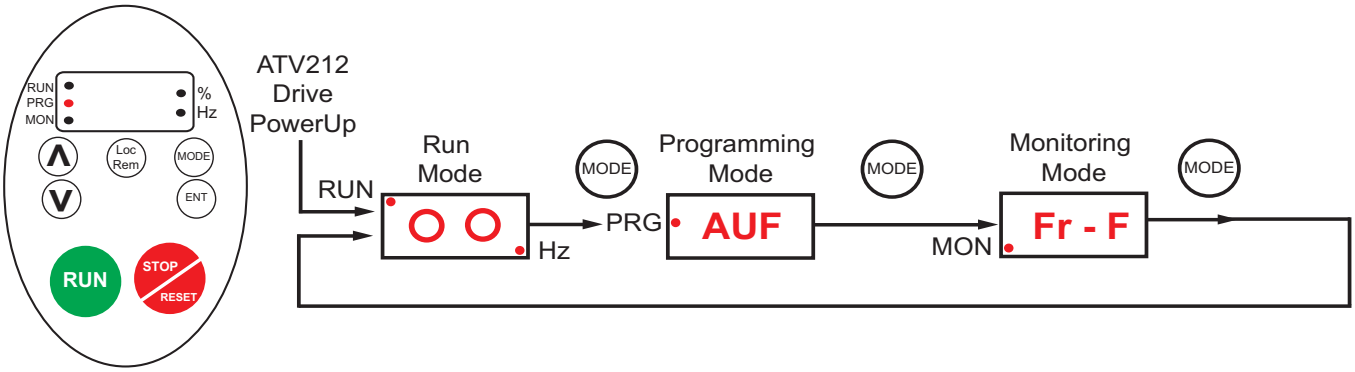
Power Up the VFD

The Altivar 212 embedded display terminal has three modes of operation:

- Monitor
- Run
- Program

The VFD powers up in the Run mode. To select a different mode, use the VFD MODE key illustrated below.

Figure 67: VFD Modes



The red LED in left side of the display indicates the mode currently selected:

- **RUN** for Run mode
- **PRG** for Programming mode
- **MON** for Monitoring mode

Program the VFD

Use the Programming mode to program the VFD.

The CFP controller sets the required parameters for the ATV212 automatically; the only manual settings required are the Modbus connector selection and the Modbus address.

Programming VFD 1

To access the Programming mode, press the **MODE** key until the PRG indicator LED on the display is illuminated.

1. Press the **Down** key until **typ** appears in the display.
2. Press the **ENT** key.
3. Press the **UP** key until **2** appears.
4. Press the **ENT** key. The ATV212 resets and **HELLO** appears.
5. Power-cycle the ATV212.
6. Enter Programming Mode.
7. Press the **Down** key until **F---** appears.
8. Press the **ENT** key.
9. Press the **Down** key until **F807** appears.
10. Press the **ENT** key
11. Press the **Down** key until **0** appears.
12. Press the **ENT** key.
13. Power-cycle the ATV212
14. Shut the enclosure door, secure the door with door fasteners, and turn the disconnect switch to the ON position.

The VFD is now ready to operate.

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Programming VFD 2

To access the Programming mode, press the **MODE** key until the PRG indicator LED on the display is illuminated.

1. Press the **Down** key until **typ** appears in the display.
2. Press the **ENT** key.
3. Press the **UP** key until **2** appears.
4. Press the **ENT** key. The ATV212 resets and **HELLO** appears.
5. Power-cycle the ATV212.
6. Enter Programming Mode.
7. Press the **Down** key until **F---** appears.
8. Press the **ENT** key
9. Press the **Down** key until **F807** appears.
10. Press the **ENT** key
11. Press the **Down** key until **0** appears.
12. Press the **ENT** key.
13. Press the **MODE** key.
14. Press the **Down** Key until **F802** appears.
15. Press the **ENT** key.
16. Press the **Up** key until **2** appears.
17. Press the **ENT** key.
18. Power-Cycle the ATV212.
19. Shut the enclosure door, secure the door with door fasteners, and turn the disconnect switch to the ON position.

The VFD is now ready to operate.

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Field Replacement of Heat Sink Fan Assembly

If a VFD heat sink fan becomes inoperable, the fan assembly must be replaced. Observe the lockout / tagout procedures.

Removing the Heat Sink Fan Assembly

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before servicing the CFP, follow the lockout/tagout procedure:
  a. Disconnect all power including external control power that may be present before servicing the CFP.
  b. Place a DO NOT TURN ON label on the CFP disconnect.
  c. Lock disconnect in the open position.
- Read and understand the DC Bus Voltage Measurement Procedure on page 32 before performing procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- **Do not** short across DC bus capacitors or touch unshielded components or terminal strip screw connectors with voltage present.
- Many parts in the CFP operate at line voltage. **Do not touch**. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

ELECTROSTATIC DISCHARGE

Do not subject this device to electrostatic discharge. This CFP contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to follow these instructions can result in injury or equipment damage.

Observe the following precautions when handling static-sensitive components:

- Keep static producing material (plastic, upholstery, carpeting) out of the immediate work area.
- Store the heat sink fan assembly in its protective packaging when it is not installed in the drive.
- When handling the heat sink fan assembly, wear a conductive wrist strap connected to the heat sink fan assembly through a minimum of one mega-ohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

To replace the heat sink fan assembly, follow these steps:

1. Turn the disconnect handle assembly to the OFF position and open the door of the CFP.
2. Measure the DC bus voltage (DC Bus Voltage Measurement Procedure, page 32).
3. Remove VFD (Removing the VFD, page 78).
4. Locate the heat sink fan assembly on rear of the VFD.

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5. Remove the fan assembly from VFD.
6. Disconnect the fan cable from the VFD.

Installing the Heat Sink Fan Assembly

To install the new heat sink fan assembly, follow these steps:

1. Connect the fan assembly wiring to the VFD.
2. Install the heat sink fan assembly onto VFD.
3. Reinstall the VFD (Installing the VFD Assembly, page 80).
4. Shut the enclosure door and secure it with door fasteners. Then turn the disconnect switch to the ON position.

Field Replacement of the Cabinet Stirring Fans

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand the precautions in Before You Begin on page 8 before you perform the procedures in this section.
- Before working on this equipment, turn off all power supplying it and perform the DC Bus Voltage Measurement Procedure on page 32.

Failure to follow these instructions will result in death or serious injury.

If a stirring fan inside the enclosure becomes inoperable, the fan must be replaced.

Before removing the inoperable stirring fan, mark and note airflow direction to ensure proper installation of the replacement fan.

Field Replacement of the Cabinet Heater on Type 3R

If a Type 3R space heater becomes inoperable, it must be replaced. The thermostat is factory set at 60°F (15°C).

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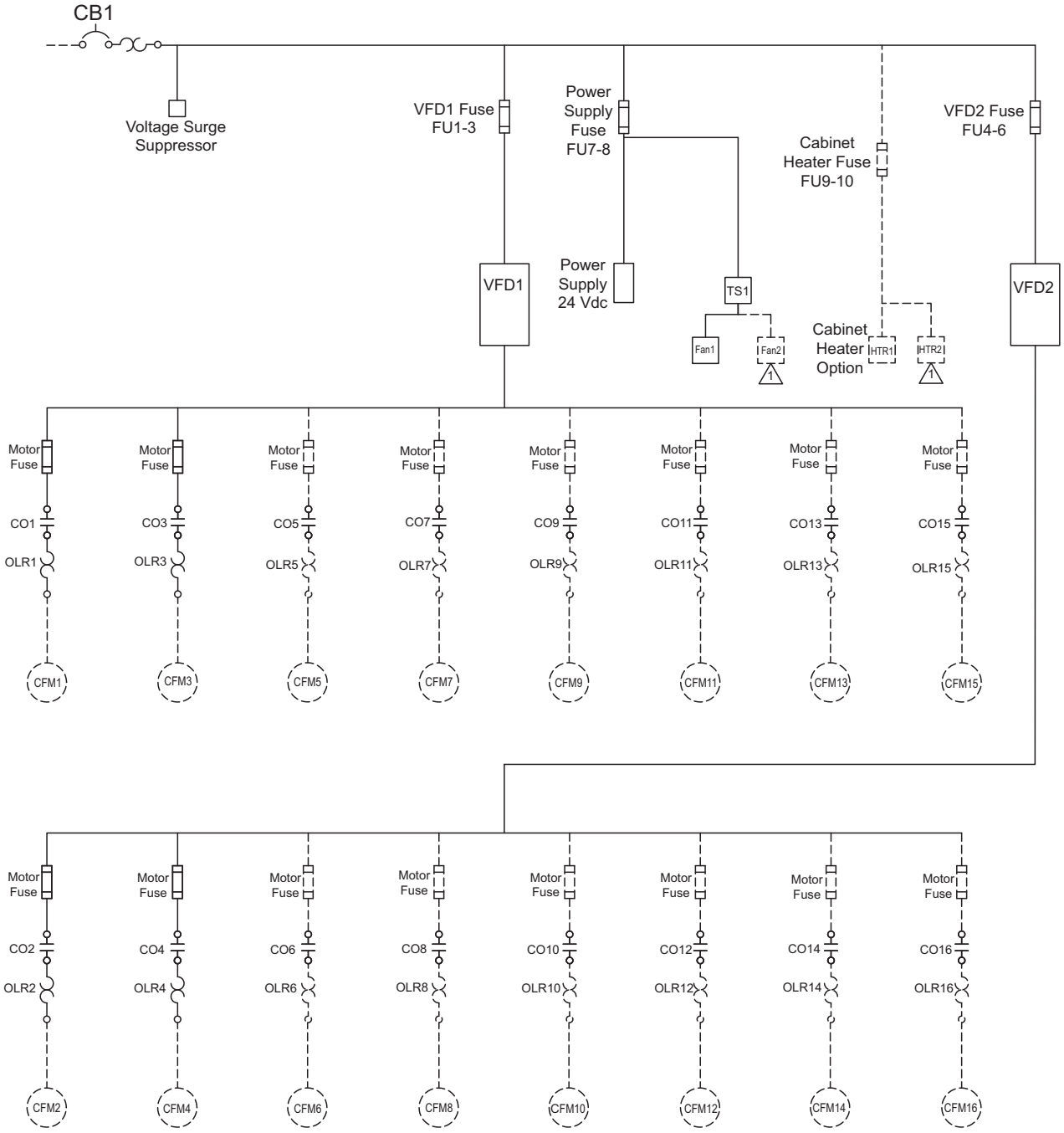
Section 6—Basic Power and Control Circuit Diagrams

Figure 68: Power Circuit without Bypass, 208 – 230 V, Three Phase



May be provided with fewer motor starters than shown, depending on the CFP catalog number.

Notes:

1. Only 1 provided in size 1 enclosures.
2. --------indicates components and wiring that is either optional or not part of all CFP catalog numbers.

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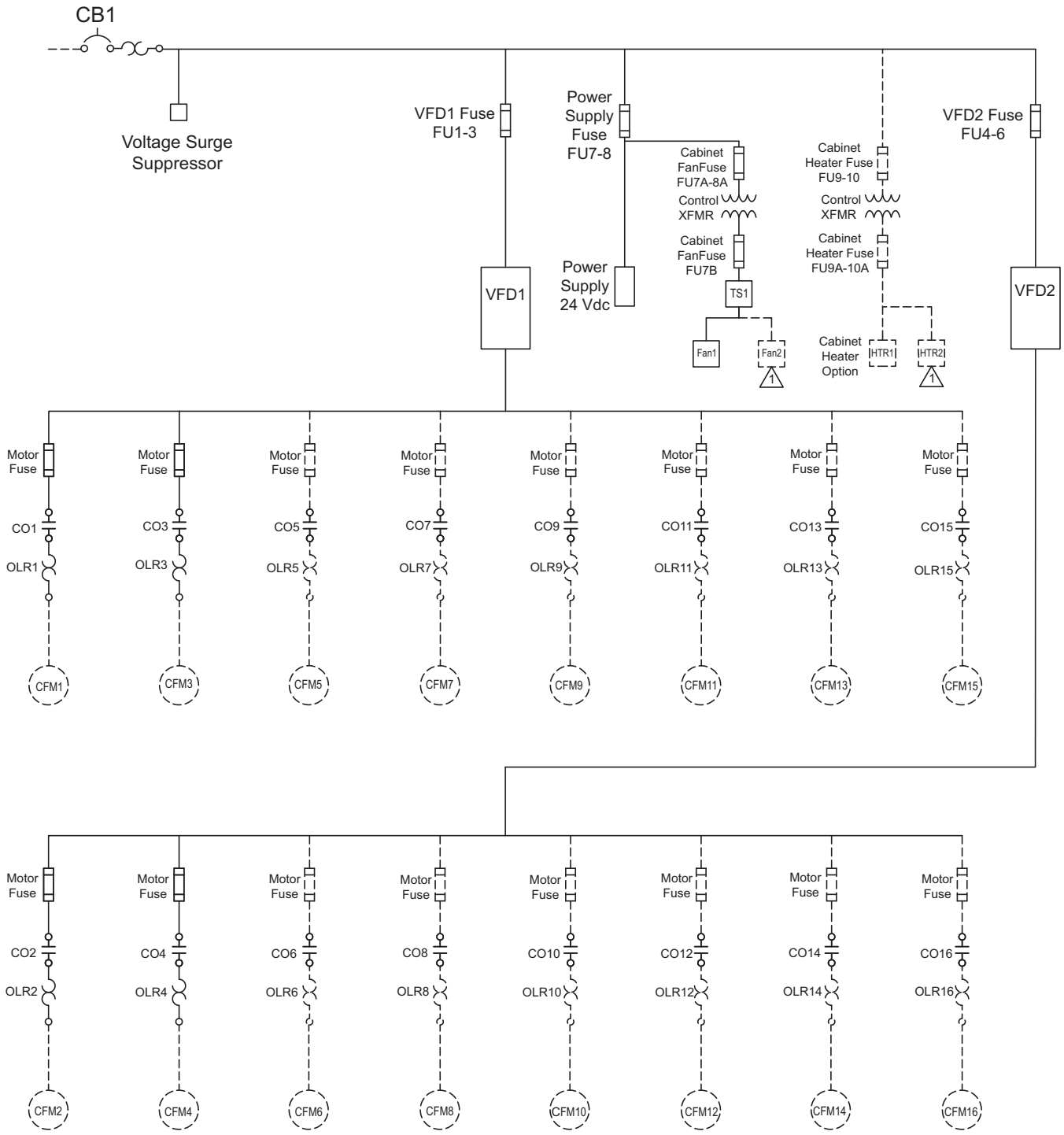
Figure 69: Power Circuit without Bypass: 480 V, Three Phase



May be provided with fewer motor starters than shown, depending on the CFP catalog number.

Notes:

1. Only 1 provided in size 1 enclosures.
2.--------indicates components and wiring that is either optional or not part of all CFP catalog numbers.

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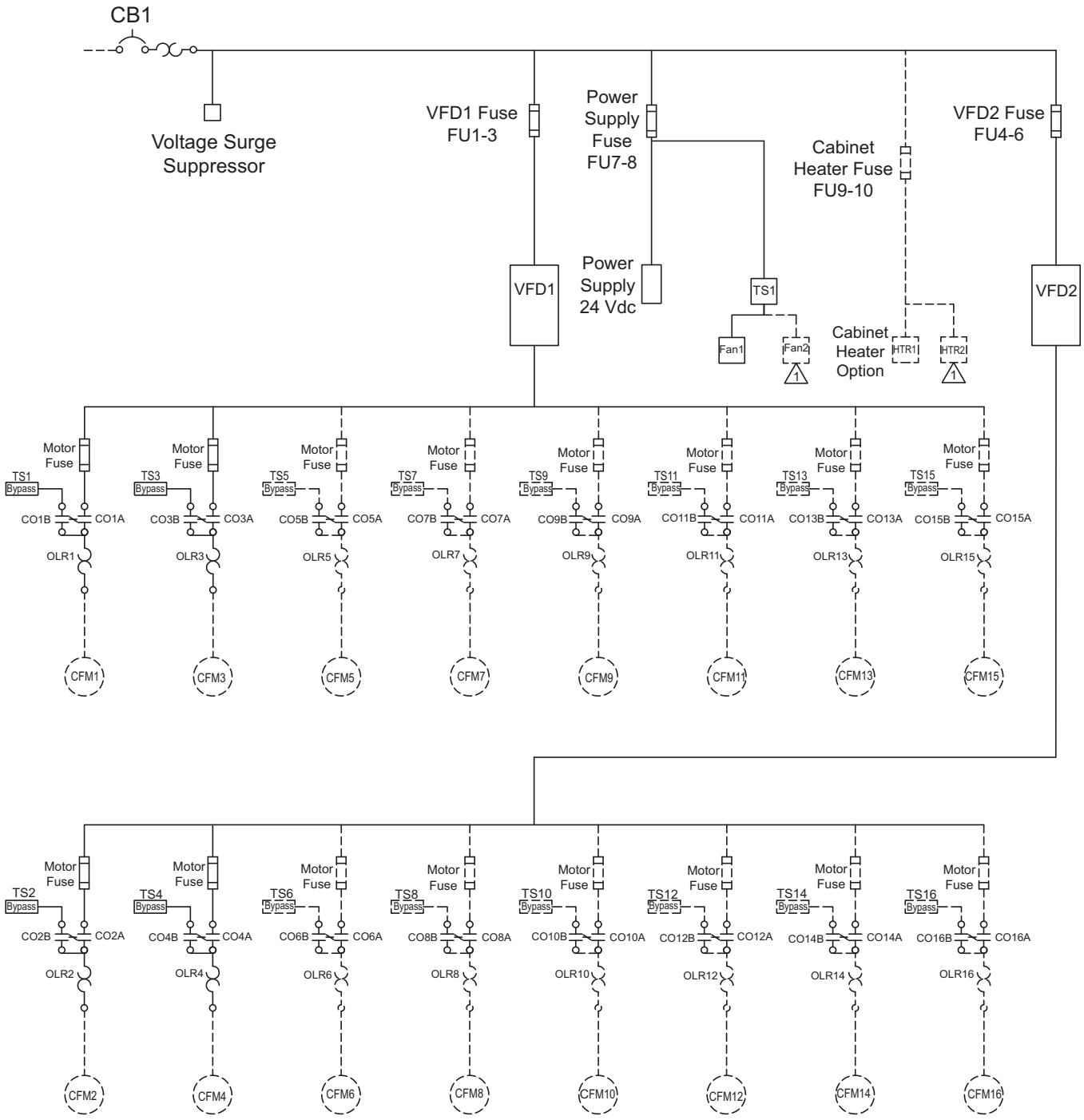
Figure 70: Power Circuit with Bypass: 208 – 230 V, Three Phase



May be provided with fewer motor starters than shown, depending on the CFP catalog number.

Notes:

1. Only 1 provided in size 1 enclosures.
2. --------indicates components and wiring that is either optional or not part of all CFP catalog numbers.

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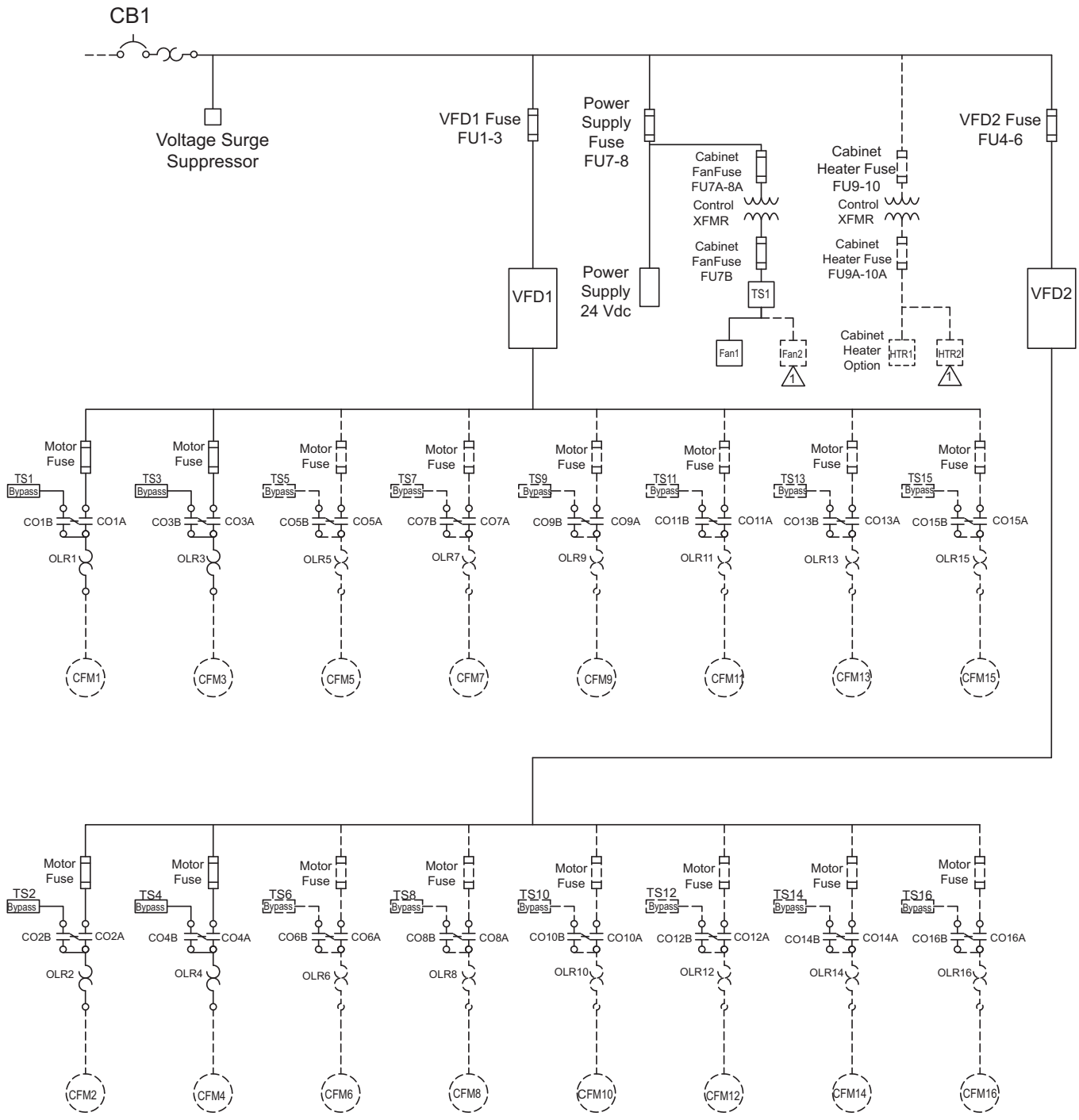
Figure 71: Power Circuit with Bypass: 480 V, Three Phase



May be provided with fewer motor starters than shown, depending on the CFP catalog number.

Notes:

1. Only 1 provided in size 1 enclosures.
2. --------indicates components and wiring that is either optional or not part of all CFP catalog numbers.

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Figure 72: Control Power Circuit, Part A

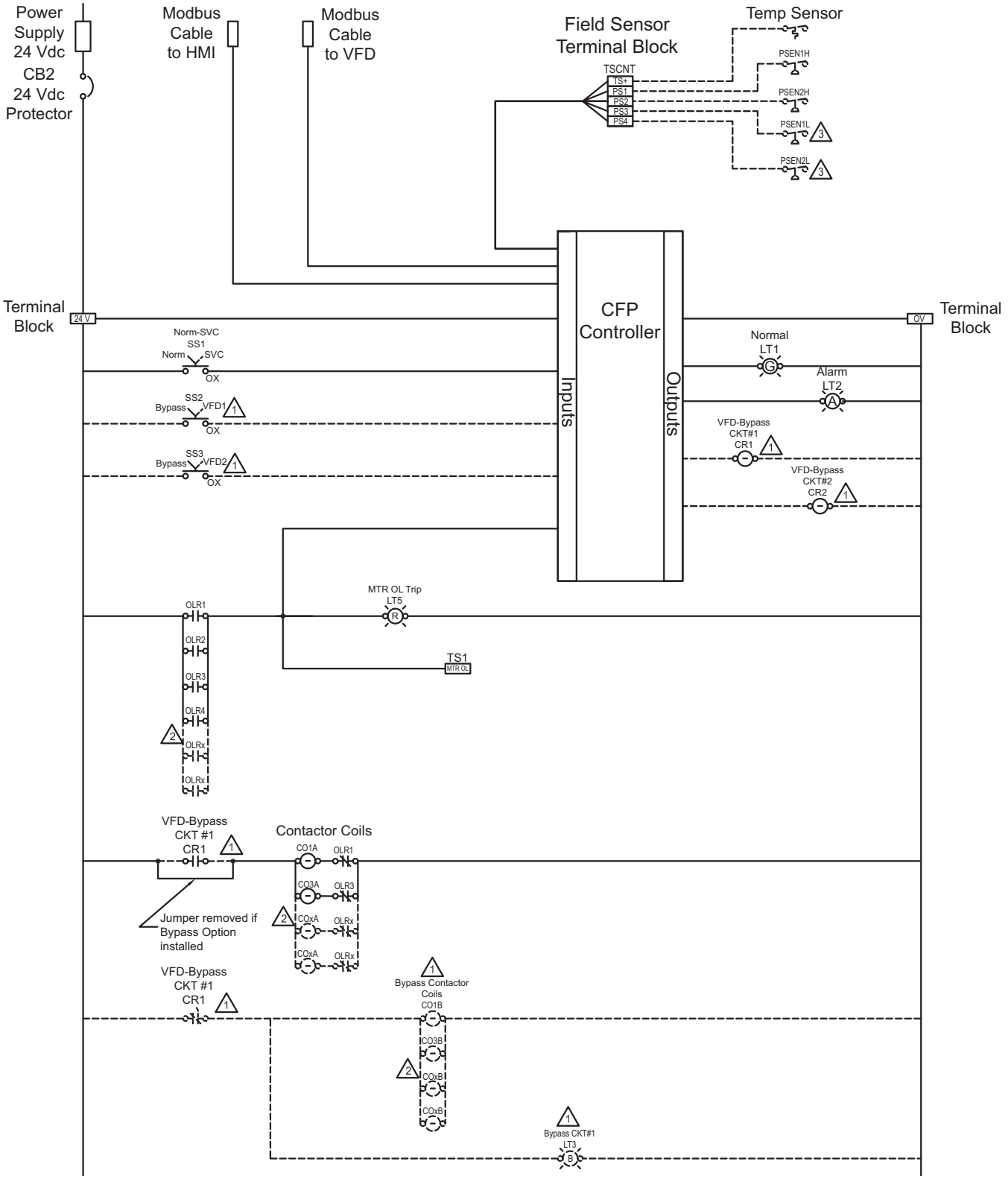
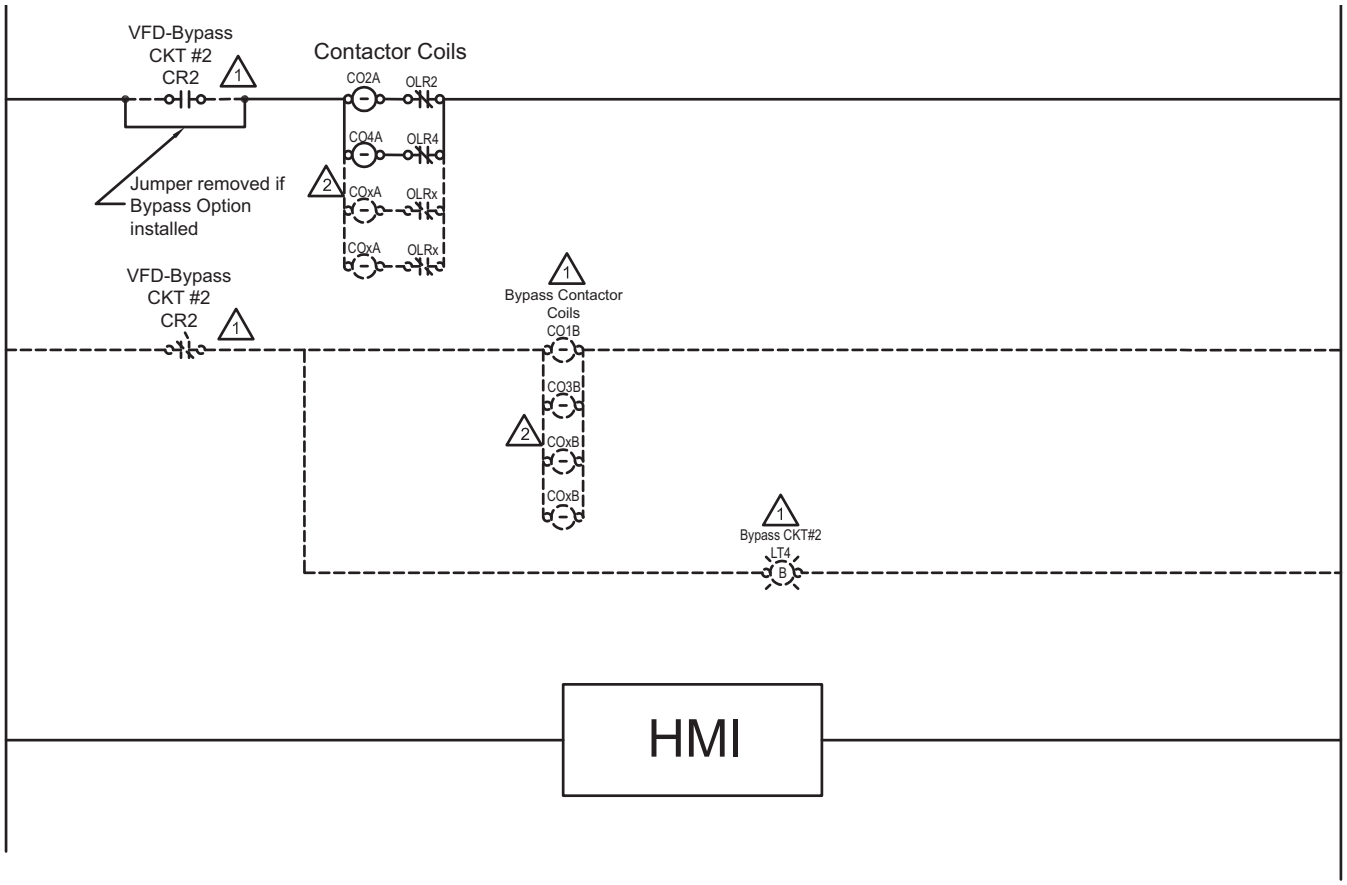


Figure 73: Control Power Circuit, Part B



Notes:

1. Provided on units with Bypass option.
2. May be provided with additional control components (up to eight per circuit), depending on CFP model number.
3. Additional sensors if CFMINLIFTKIT is ordered for minimum differential pressure type chiller.

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APPENDIX A— RENEWABLE PARTS

Table 25: Common Parts

Renewable Part Description	Part Number
CFP Controller[1]	TM168B23CSCF[2]
3.5" Color HMI[1]	HMISTU655CF
Surge Arrester 600 V 3-wire Delta 200 kA	SDSA3650D
Stirring Fan (208-240 V panels only)	NSYCVF170M230
Stirring Fan (480 V panels only)	3115806550
Stirring Fan Transformer (480/120 V, 100 VA - **480 V panels only**)	9070TF100D1
Stirring Fan Thermostat	NSYCCOTHOF
Power Supply 24 Vdc 3 Amp	ABL8RPS24030
Supplemental Protector 4A, 1P, 24 Vdc	MG24428
SPDT Relay with Test Button and LED, 24 Vdc Coil	RPM12BD
Relay Socket Base	RPZF1
Refrigerant Pressure Sensor, 0-60 BAR	XMLP060BD79
Woodhead M12 Female 90 ° Elbowed to Flying Leads Outdoor Rated Cable - 10 M	803001C02M100
Outdoor Air Temperature Thermistor, 10k Ohm@25C	102OB2
BACNET MS/TP Communication Module	TM168BACS
BACNET IP Communication Module	TM168BACW
MODBUS TCP Communication Module	TM168MODW
550 W, 230 V Cabinet Heater with Thermostat	NSYCRP1W230VTVC
Cabinet Heater Transformer 480/240 V, 750 VA **CFP Size 1 Enclosure (480 V panels only)**	9070TF750D31
Cabinet Heater Transformer 480/240 V, 1500 VA **CFP Size 2 Enclosure (480 V panels only)**	9070TF1500D31

1 Part requires custom program and must be ordered from Schneider Electric Industrial Repair Services.

2
- TM168B23CSCF**X** = None
- TM168B23CSCF**1** = BACnet IP
- TM168B23CSCF**2** = BACnet MS/TP
- TM168B23CSCF**3** = Modbus TCP

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Table 26: 208 V - 230 V Renewable Parts

Renewable Part Description	Part Number	3.8 - 5.5 FLA MOTORS/VFD CKT				5.5 - 8.0 FLA MOTORS/VFD CKT				8.0 - 11.0 FLA MOTORS/VFD CKT			
		2	4	6	8	2	4	6	8	2	4	6	8
Rotary Disconnect Handle, 3 inch	9421LH3	X	X			X	X			X			
Rotary Disconnect Handle, 6 inch	9421LH6			X	X			X	X		X	X	X
CB Disconnect Operating Mechanism	9421LJ7	X	X	X	X	X	X	X	X	X	X	X	X
Circuit Breaker 600V, 250A	JLL36250							X	X			X	
Circuit Breaker 600V, 250 A - 100% USE	JLL36250C												X
Circuit Breaker 600V, 150 A	HLL36150	X	X	X	X	X	X			X	X		
VFD 208-240 Vac 5HP	ATV212HU40M3X	X				X							
VFD 208-240 Vac 7.5HP	ATV212HU55M3X		X							X			
VFD 208-240 Vac 10HP	ATV212HU75M3X						X						
VFD 208-240 Vac 15HP	ATV212HD11M3X			X	X						X		
VFD 208-240 Vac 20HP	ATV212HD15M3X							X					
VFD 208-240 Vac 25HP	ATV212HD18M3X								X			X	
VFD 208-240 Vac 30HP	ATV212HD22M3X												X
Non-Bypass Panels													
Contactor 600V, 6 AMP - 24 Vdc Coil	LP4K0610BW3	X	X	X	X								
Contactor 600V, 9 AMP - 24 Vdc Coil	LP4K0910BW3					X	X	X	X				
Contactor 600V, 12 AMP - 24 Vdc Coil	LP4K1210BW3									X	X	X	X
Motor Overload Relay - 3.8 - 5.5 AMP	LR2K0312	X	X	X	X								
Motor Overload Relay - 5.5 - 8.0 AMP	LR2K0314					X	X	X	X				
Motor Overload Relay - 8.0 - 11.5 AMP	LR2K0316									X	X	X	X
Bypass Panels													
Rev Contactor 600 V, 6 AMP - 24 Vdc Coil	LP5K0610BW3	X	X	X	X								
Rev Contactor 600 V, 9 AMP - 24 Vdc Coil	LP5K0910BW3					X	X	X	X				
Rev Contactor 600 V, 12 AMP - 24 Vdc COIL	LP5K1210BW3									X	X	X	X
Motor Overload Relay - 3.8 - 5.5 AMP	LR2K0312	X	X	X	X								
Motor Overload Relay - 5.5 - 8.0 AMP	LR2K0314					X	X	X	X				
Motor Overload Relay - 8.0 - 11.5 AMP	LR2K0316									X	X	X	X

For motor overload relay, Part Number LR2K03xx, leave overload reset in factory default position of HAND (H) reset operation.

For LP5Kxx10BW3 contactor replacement instructions, see Figures 74 and 75 on page 97.

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Table 27: 480 V Renewable Parts

Renewable Part Description	Part Number	1.8 - 2.6 FLA MOTORS/VFD CKT				2.6 - 3.7 FLA MOTORS/VFD CKT				3.8 - 5.5 FLA MOTORS/VFD CKT			
		2	4	6	8	2	4	6	8	2	4	6	8
Rotary Disconnect Handle, 3 inch	9421LH3	X	X			X	X			X	X		
Rotary Disconnect Handle, 6 inch	9421LH6			X	X			X	X			X	X
CB Disconnect Operating Mechanism	9421LJ7	X	X	X	X	X	X	X	X	X	X	X	X
Circuit Breaker 600V, 150A	HLL36150	X	X	X	X	X	X	X	X	X	X	X	X
VFD 480 Vac 5HP, ATV212	ATV212HU40N4	X											
VFD 480 Vac 7.5HP, ATV212	ATV212HU55N4		X			X				X			
VFD 480 Vac 10HP, ATV212	ATV212HU75N4			X			X						
VFD 480 Vac 15HP, ATV212	ATV212HD11N4				X			X			X		
VFD 480 Vac 20HP, ATV212	ATV212HD15N4								X				
VFD 480 Vac 25HP, ATV212	ATV212HD18N4											X	
VFD 480 Vac 40HP, ATV212	ATV212HD30N4												X
Non-Bypass Panels													
Contactor 600V, 6 AMP - 24 Vdc Coil	LP4K0610BW3	X	X	X	X	X	X	X	X	X	X	X	X
Motor Overload Relay - 1.8 - 2.6 AMP	LR2K0308	X	X	X	X								
Motor Overload Relay - 2.6 - 3.7 AMP	LR2K0310					X	X	X	X				
Motor Overload Relay - 3.8 - 5.5 AMP	LR2K0312									X	X	X	X
Bypass Panels													
Rev Contactor 600 V, 6 AMP - 24 Vdc Coil	LP5K0610BW3	X	X	X	X	X	X	X	X	X	X	X	X
Motor Overload Relay - 1.8 - 2.6 AMP	LR2K0308	X	X	X	X								
Motor Overload Relay - 2.6 - 3.7 AMP	LR2K0310					X	X	X	X				
Motor Overload Relay - 3.8 - 5.5 AMP	LR2K0312									X	X	X	X

For motor overload relay, Part Number LR2K03xx, leave overload reset in factory default position of HAND (H) reset operation.

For LP5Kxx10BW3 contactor replacement instructions, see Figures 74 and 75 on page 97.

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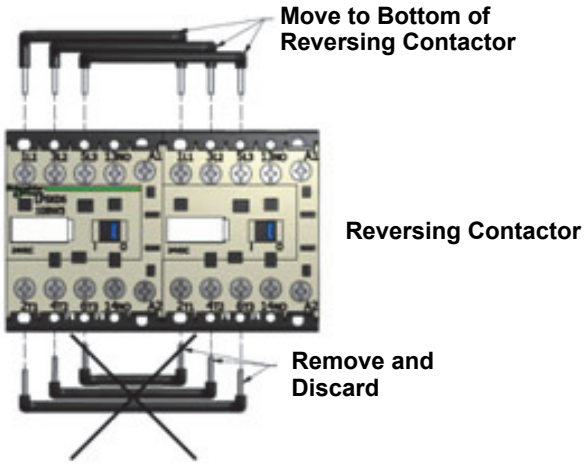
APPENDIX B— FIELD REPLACEMENT OF LP5KXX10BW3 CONTACTOR

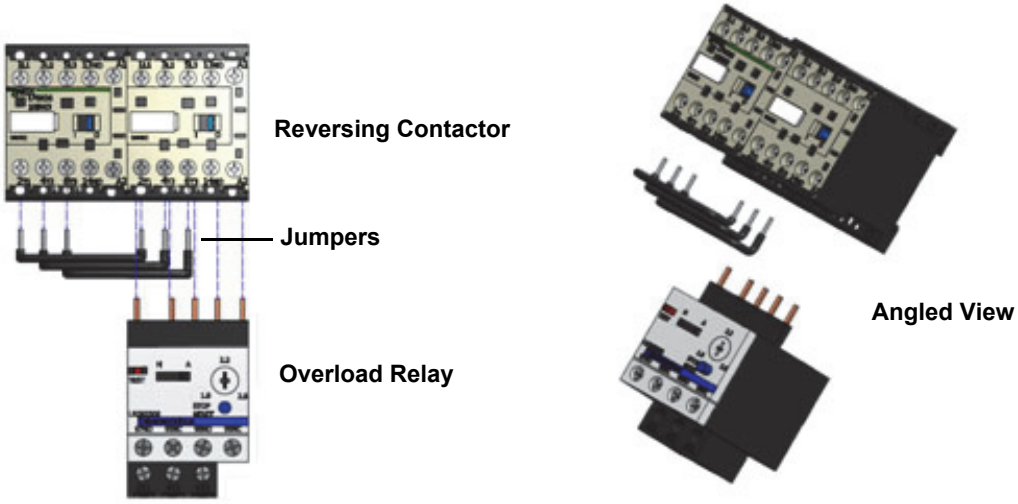
1. Remove and discard the bottom set of jumpers from the reversing contactor, as shown in Figure 74:

Figure 74: Reversing Contactor



2. Connect the top set of jumpers to the bottom of the reversing contactor in the following terminal sequence:
   a. 2T1 to 2T1
   b. 4T2 to 4T2
   c. 6T3 to 6T3
3. Connect the overload relay to the bottom of the reversing contactor as shown in Figure 75:

Figure 75: Connect Reversing Contactor and Overload Relay



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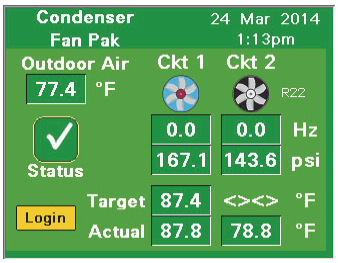
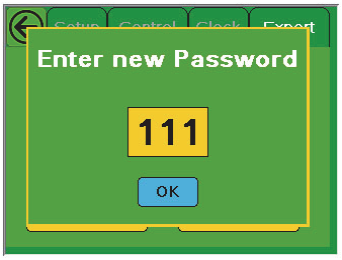
APPENDIX C— HMI SCREENS AND DEFAULT SETTINGS

Figure 76: Login Screen



Menu Bar	Condenser Fan Pak
Date/Time	Unspecified
Display Units	F/psi
Refrigerant	R404A
Fan Status Icons	Idle (gray)
Outdoor Air °F	Unspecified
Hz	0.0
psi	Unspecified
Target °F	<><>
Actual °F	Unspecified
Status Icon	OK

Figure 77: Password Screen



Default Password	111

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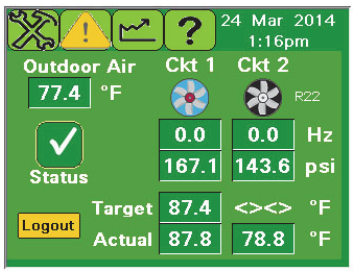
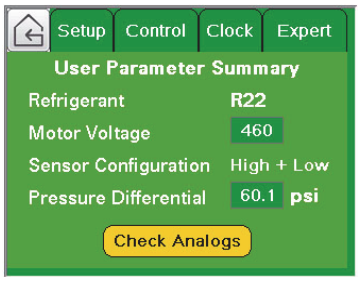
Figure 78: Home Screen



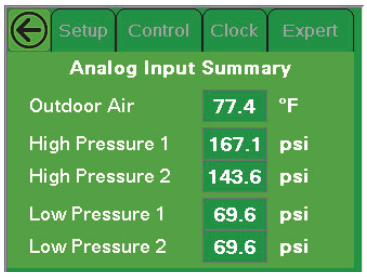
Menu Bar	Condenser Fan Pak
Date/Time	Unspecified
Display Units	F/psi
Refrigerant	R404A
Fan Status Icons	Idle (gray)
Outdoor Air °F	Unspecified
Hz	0.0
psi	Unspecified
Target °F	<><>
Actual °F	Unspecified
Status Icon	OK

Figure 79: User Parameter Summary



Refrigerant	R404A
Motor Voltage	300
Sensor Configuration	High + Low
Pressure Differential	60.1

Figure 80: Analog Input Summary



Sensor readings: values unspecified

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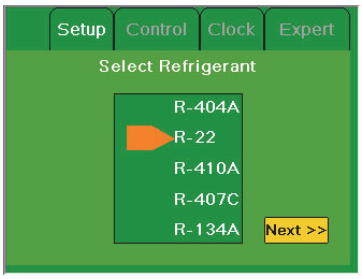
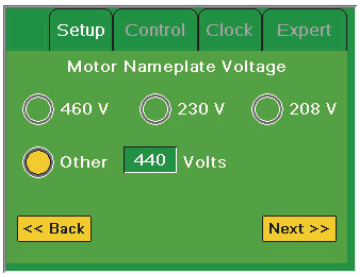
Figure 81: Select Refrigerant



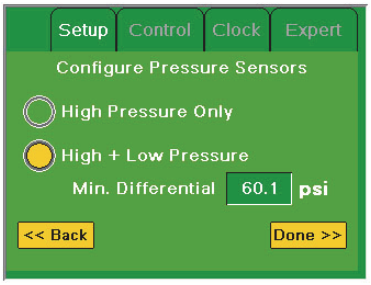
Default Refrigerant	R404A

Figure 82: Motor Nameplate Voltage



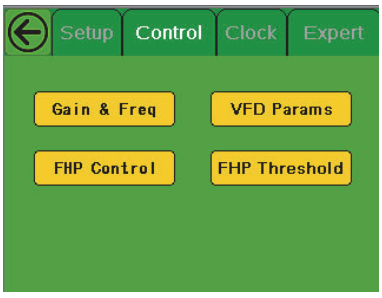
Default Selection	Other
Voltage Value	300

Figure 83: Configure Pressure Sensors



Default Selection	High + Low
Min Differential	60.1 psi

Figure 84: Control Tab Menus



No defaults

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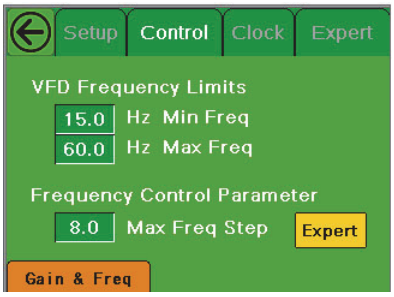
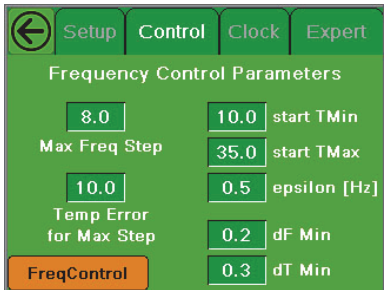
Figure 85: Control Gain and Frequency



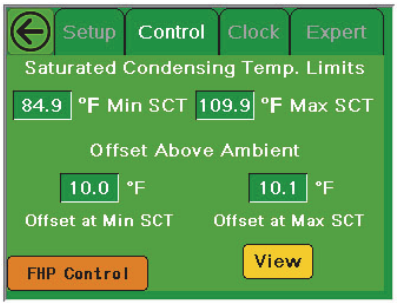
Min Freq	20.0
Max Freq	60.0
Max Freq Step	10

Figure 86: Frequency Control



Max Freq Step	10.0 (Hz)
Temp Error for Max Step	10 (˚C)
Start Tmin	10 (˚C)
Start Tmax	35 (˚C)
Epsilon	0.5 (Hz)
dF Min	0.2 (Hz)
dT Min	0.3 (˚C)

Figure 87: Control Floating Head Pressure Parameters



Min SCT	84.2
Max SCT	109.4
Offset at Min SCT	10.0
Offset at Max SCT	10.0

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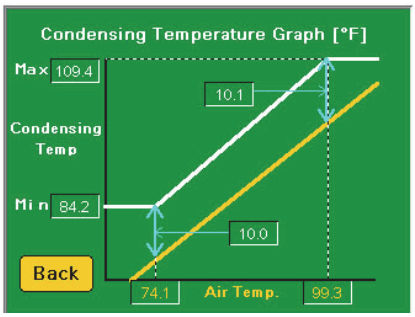
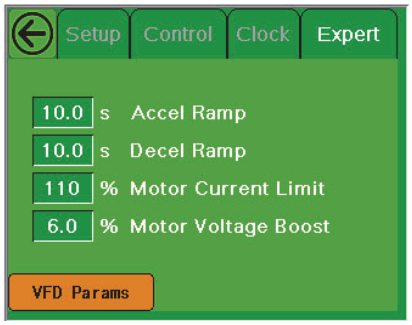
Figure 88: Floating Head Pressure Parameter



Display only, no parameter entry

Figure 89: Control VFD Parameters



Accel Ramp	10.0 s
Decel Ramp	10.0 s
Motor Current Limit	110%
Motor Voltage Boost	6%

Figure 90: Control FHP Threshold Parameters

Turn-ON	29.0 psi
Turn-OFF	14.5 psi

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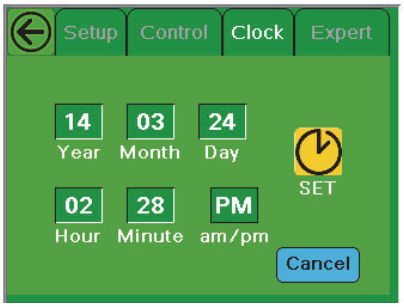
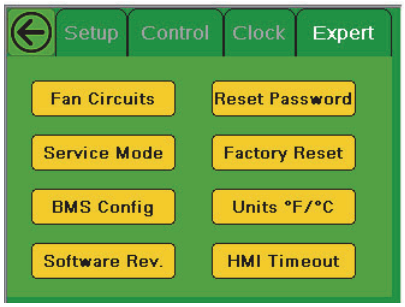
Figure 91: Clock Set



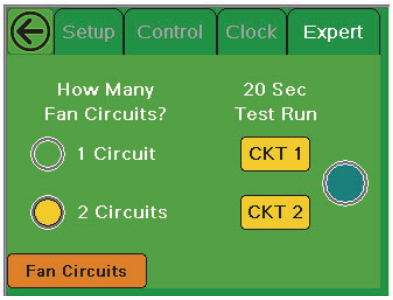
Values unspecified

Figure 92: Expert Tab Menu



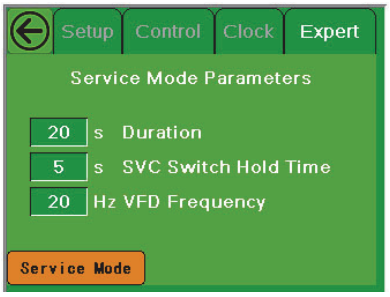
No Parameter entry

Figure 93: Expert Fan Circuits



Default Selection	Two circuits

Figure 94: Service Mode Parameters



Duration	20 s
SVC Switch Hold Time	5 s
VFD Frequency	20 Hz

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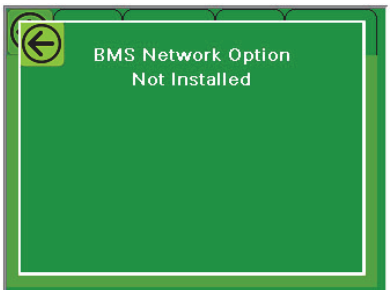
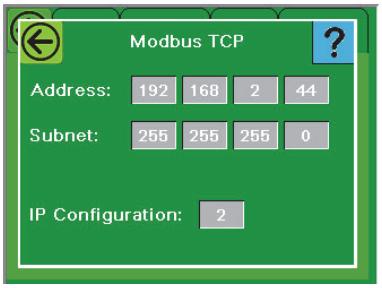
Figure 95: Expert BMS Configuration



No BMS option installed

Figure 96: Modbus TCP Parameters



Address	192.168.2.44
Subnet Mask	255.255.255.0
IP Configuration	2

Figure 97: Modbus TCP Help

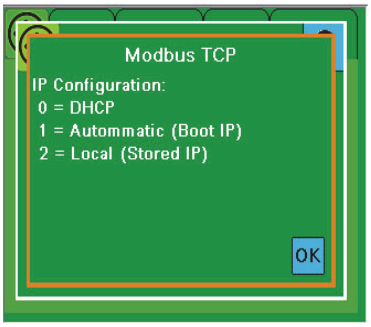


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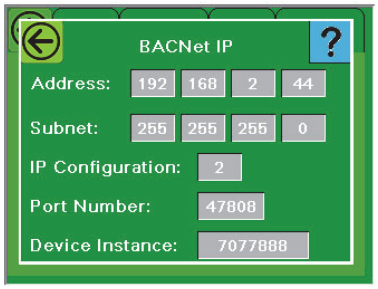
Figure 98: BACnet IP Parameters



Address	192.168.2.44
Subnet Mask	255.255.255.0
IP Configuration	2
Port Number	47808
Device Instance	7077888

Figure 99: BACnet IP Parameters Help

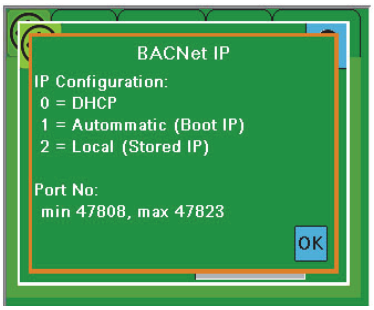
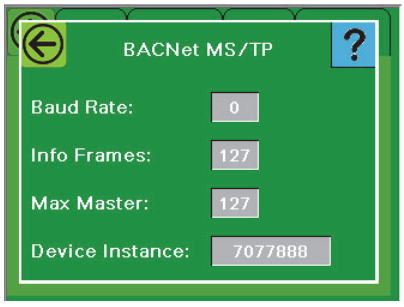


Figure 100: BACnet MS/TP Parameters



Baud Rate	0
Info Frames	3
Max Master	127
Device Instance	7077888

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Figure 101: BACnet MS/TP Parameters Help

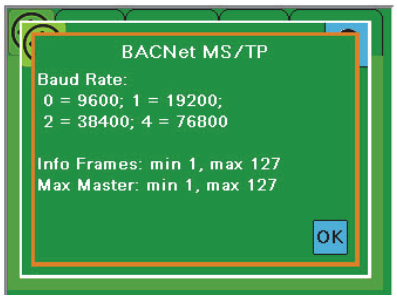
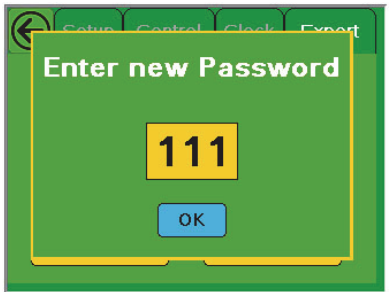


Figure 102: Expert Software Rev

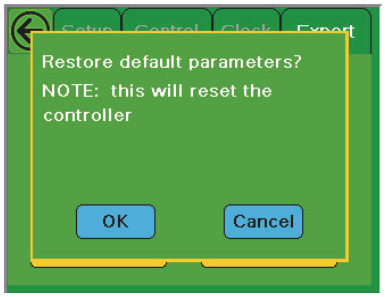
Controller	2.1.0
HMI	2.1.0

Figure 103: Password Reset Screen



Default Password	111

Figure 104: Expert Restore Default Parameters



No Parameter entry

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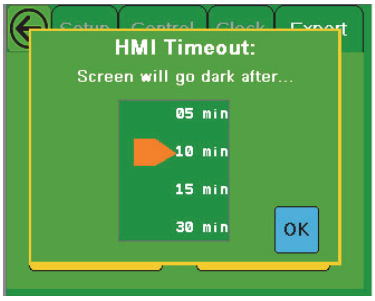
Figure 105: Units Selection

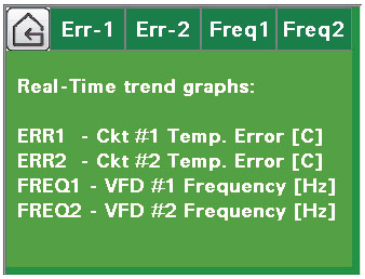
Default Selection	°F, psi

Figure 106: HMI Timeout



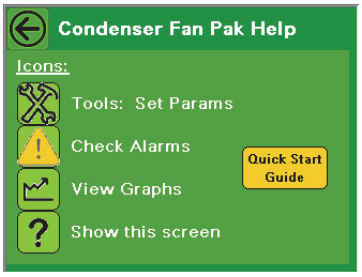
Default Selection	10 min

Figure 107: Trend Graph Menu



Information only

Figure 108: Main Help Screen



Information only

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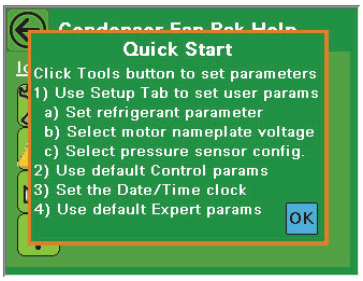
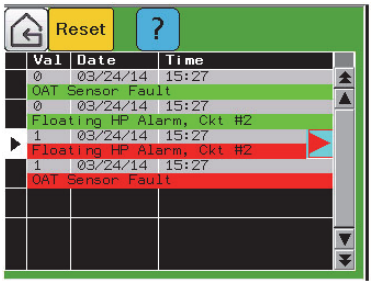
Figure 109: Quick Start Guide


Quick Start
Click Tools button to set parameters
1) Use Setup Tab to set user params
a) Set refrigerant parameter
b) Select motor nameplate voltage
c) Select pressure sensor config.
2) Use default Control params
3) Set the Date/Time clock
4) Use default Expert params
OK

Information only

Figure 110: Alarm Log



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APPENDIX D— BMS VARIABLES REGISTER MAP

Address	Name	Description
200	BMS_bCallForCooling	Bit set when either compressor detected ON
201	BMS_bSW_BP_CKT1	State of BYPASS_CKT1 switch 1=BYP, 0 = VFD
202	BMS_bSW_BP_CKT2	State of BYPASS switch 1=BYP, 0 = VFD
203	BMS_CondTempCalc_1	Condensing temperature, calculated from high pressure measurement
204	BMS_CondTempCalc_2	Condensing temperature, calculated from high pressure measurement
205	BMS_CondTempSetPt_1	Condensing temperature setpoint, from Floating High Pressure block
206	BMS_CondTempSetPt_2	Condensing temperature setpoint [0.1C]
207	BMS_EstAmbientPressure	Estimated saturated refrigerant temperature, at temperature = OAT
208	BMS_fanMode_1	Fan control mode: 0 = floating HP, 1 = const freq FWD, 2 = const freq REV
209	BMS_fanMode_2	Fan control mode: 0 = floating HP, 1 = const freq FWD, 2 = const freq REV
210	BMS_FHPAlarmID_1	Alarm ID Byte from FloatingHighPressureControl block
211	BMS_FHPAlarmID_2	Alarm ID Byte from FloatingHighPressureControl block
212	BMS_FreqRef1	VFD Frequency command from fan control block
213	BMS_FreqRef2	VFD Frequency command from fan control block
215	BMS_HP_CondTempMax	Maximum allowable condensing temperature setpoint [C]
216	BMS_HP_CondTempMin	Minimum allowable condensing temperature setpoint [C]
219	BMS_HP_FanFreqMax	Maximum value of Fan Frequency output
220	BMS_HP_FanFreqMin	Minimum value of Fan Frequency output
221	BMS_HP_OATempMax	Air temperature corresponding to CondensingTemp Max [C]
222	BMS_HP_OATempMin	Air temperature corresponding to CondensingTemp Min [C]
224	BMS_HP_RefrType	1=R404A, 2=R22, 3=R410A, 4=R407C, 5=R134A, 6=CUSTOM
226	BMS_IO_HP_Abs_1	Absolute pressure, Ckt1
227	BMS_IO_HP_Abs_2	Absolute pressure, Ckt 2
228	BMS_IO_HP_Gage_1	HP Sensor reading, [.01bar]
229	BMS_IO_HP_Gage_2	HP Sensor reading, [.01bar]
230	BMS_IO_OAT_C	Outdoor air sensor reading [.1C]
231	BMS_IO_OAT_F	Outdoor air sensor reading [.1F]
232	BMS_MON_aStatus_1	Status word from VFD via Modbus Master
233	BMS_MON_aStatus_2	Status word from VFD via Modbus Master
234	BMS_MON_bFreq_1	VFD output frequency, via Modbus Master
235	BMS_MON_bFreq_2	VFD output frequency, via Modbus Master
236	BMS_MON_cCurrent_1	VFD output current, via Modbus Master
237	BMS_MON_cCurrent_2	VFD output current, via Modbus Master
238	BMS_MON_dVoltage_1	VFD output voltage, via Modbus Master
239	BMS_MON_dVoltage_2	VFD output voltage, via Modbus Master
240	BMS_MON_eAlarmInfo_1	VFD Alarm Info, via Modbus Master
241	BMS_MON_eAlarmInfo_2	VFD Alarm Info, via Modbus Master
242	BMS_P_CleanFreq	Inverter frequency for coil cleaning mode
243	BMS_P_CleanModeTime	Duration of coil cleaning mode [sec]
244	BMS_P_FanTestFreq	Inverter frequency for fan test mode
245	BMS_P_FanTestTime	Duration of fan test mode [sec]
247	BMS_P_VFD_Accel	VFD accel ramp time [0.1 sec]
248	BMS_P_VFD_CurrLim	Current limit [%]
249	BMS_VFD_TripCode_1	VFD1 Trip Code
250	BMS_VFD_TripCode_2	VFD2 Trip Code
251	BMS_HPFault_1	High pressure sensor fault, ckt 1

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Address	Name	Description
252	BMS_HPFault_2	High pressure sensor fault, ckt 2
253	BMS_HPOnly	TRUE = High pressure control only; FALSE = minimum lift control w/ low pressure sensor added
254	BMS_IO_LP_Abs_1	Absolute pressure, Ckt1 [.01 bar]
255	BMS_IO_LP_Abs_2	Absolute pressure, Ckt2 [.01 bar]
256	BMS_IO_LP_Gage_1	Gage pressure, Ckt1
257	BMS_IO_LP_Gage_2	Gage pressure, Ckt2
258	BMS_LPFault_1	Low pressure sensor fault, ckt 1
259	BMS_LPFault_2	Low pressure sensor fault, ckt 2
260	BMS_MinLIft	Minimum pressure differential, bar (60 psi = 4.14 bar)
261	BMS_PressureDiff_1	Refrigerant circuit #1 pressure differential [.01bar]
262	BMS_PressureDiff_2	Refrigerant circuit #2 pressure differential [.01bar]

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